AppCoins

Crowdsale

23 October 2017

Executive Summary

With the rise of the Internet came the open source culture. Massive and open collaboration between people and organizations became a real possibility. We see it every day: from Linux to Wikipedia, from Creative Commons to Open Access. It is ubiquitous. Android is one such platform. While it was meant to be open, in practice, this is not always the case. It makes up the biggest part of the global app economy - by the last quarter of 2016, the Android OS had 81.7% of the app market share - but it is currently experiencing a number of issues. Large players enjoy the compounding interest of incumbency. They concentrate wealth and power in the hands of the few. This has a negative impact on consumer privacy and user experience, almost always at the expense of new entrants to the sector. Making app economy transactions safe is essential to ensure trust in the industry.

The app economy has three main problems:

1. Advertising is inefficient. It relies on many adtech middlemen, increasing the cost of user acquisition for app developers, reducing transparency and generating fraud in transactions.

2. App monetization and in-app purchases (IAP) are still not massified and are costly. IAPs rely on payment methods and flows that are not accessible to many users, especially in emerging markets where the transactions costs are high, with significant margins being taken by payment processors and other fintech middlemen.

3. The app approval process is not transparent. App approval is a complex process that is currently being handled by centralized stores with complex quality assurance flows and relying on non-transparent app distribution policies.

AppCoins is the solution. It is an open and distributed protocol for app stores based on the Ethereum blockchain, using the ERC20 standard. It proposes to move the following three critical flows to the blockchain: advertising, in-app billing and app approvals. By redesigning the transactions inside app stores, it creates efficiencies by disintermediation and redistributes the value released in a way that creates incentives for AppCoins supported stores.

In advertising, the protocol guarantees not only that the users install apps but that they pay attention to it during at least 2 minutes (Cost Per Attention - CPAt). The value invested by the developer in CPAt is then used to award the user with AppCoin tokens for their attention. These AppCoin tokens are stored in user's wallets. IAP transactions will grow because users can make purchases directly, using their earned AppCoins or by purchasing them through various payment

methods. Financial transactions are registered in the blockchain and later used to detect double spending and to guarantee user authenticity. App approvals are made universal and more transparent through a developer reputation system. The reputation is tied to the financial transactions on the public ledger and is auditable. A dispute system will be created so that AppCoin owners can open a ranking for developers.

The AppCoins business model will have a considerable impact on the app economy. It enables a transition towards a circular economy, reusing value that was previously drained by intermediaries. This circular economy is consistent with well-known optimal growth models. Markets that behave similarly to these are healthy economies. Additionally, the AppCoins protocol promotes several direct and indirect network effects. For now, the AppCoins project will focus on the Android market, which has the majority app market share. The adoption of AppCoins in this market will benefit from Aptoide's support and its 200 million user base, the openness of the protocol and technology, the open governance based on the creation of the App Store Foundation, the user reward system and the disintermediation on the main app store flows. According to our forecast, the platform will reach more than 1.3 billion users in 5 years.

To ground the impact of AppCoins in the apps economy, on section 4 we provide a sustained business case. Despite the forecast of reduction of the price of CPAt when compared to current CPI models, after 12 months, the monthly incomes generated with AppCoins are more than double the current incomes of apps advertising. After 24 months, the value generated with AppCoins is 4 times larger than the one without AppCoins. Regarding IAP, after 12 months, the revenue will more than double and, after the 24th month, the IAP revenue with AppCoins will be 4 times bigger than the revenue without this model. In 5 years, it is expected to bring total monthly incomes of more than US$4B to developers, app stores, OEMs and users, in IAP and app advertising.

The AppCoin token price fluctuates considering its estimated market cap (achieved using Metcalfe's law and the forecast of adoption) and the token supply in circulation. It is projected that after two years, it will have a market valuation almost 12 times bigger than the price of crowdsale, and 1 789 times bigger in 5 years.

Regarding the AppCoins ICO (chapter 7), 40% of all tokens generated will be offered in pre-sales (12% with 30% discount) and token sales (28%). The token value at the crowdsale will be of US$0.10, the soft cap US$2.5M and the hard cap will be US$28M. The remaining tokens will be distributed among the App Store Foundation (15%), bootstrap strategies for the key players in the apps economy (20%), Aptoide (15%) and the key contributors to AppCoins idea (10%).

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1 Mobile App Ecosystem Context

This section serves as an introduction to the context of the mobile app ecosystem. Here we identify the present state of the industry and its current problems, bringing us to the proposed AppCoins solution. If you want to skip the context and start reading about the AppCoins Protocol overview, jump to chapter 2.

The number of smartphone users is forecasted to grow from 2.6 billion in 2017 to nearly 4 billion by 2020 [1]. With increasing smartphone penetration rates and 36% of the world's population projected to use a smartphone by 2018 [2], it makes mobile apps one of the most influential and powerful industries, mobilizing a number of players to participate in the ecosystem.

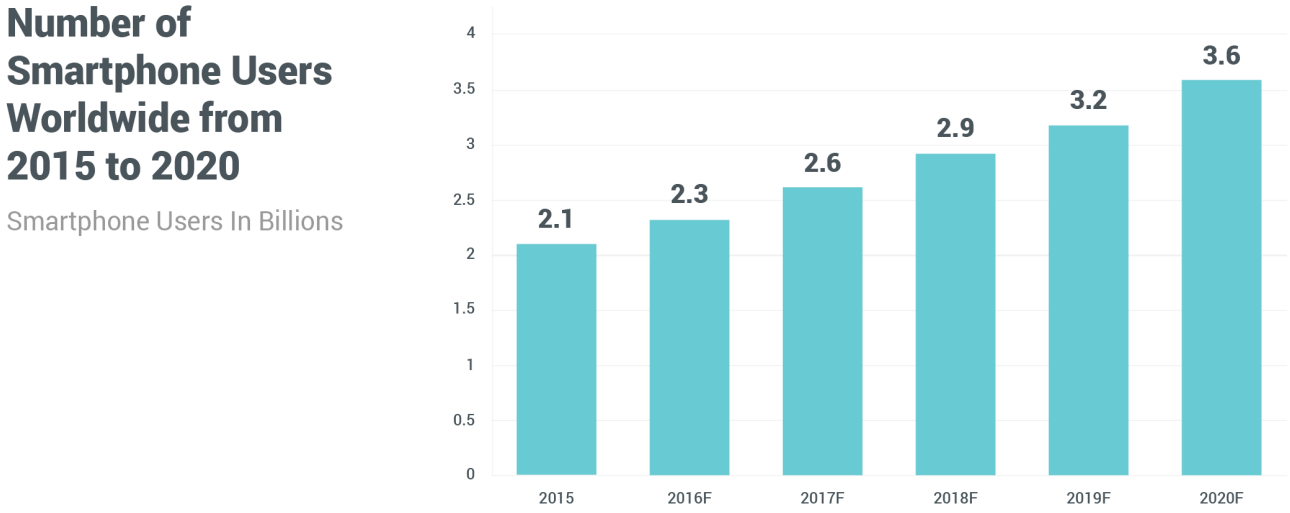


Figure 1 - Number of Smartphone Users Worldwide [1]

The gross revenue of the entire mobile ecosystem was estimated to be worth +US$50 billion in 2016, growing to +US$88 billion in 2017, while the mobile app market is forecasted to reach US$100 billion worldwide by 2020 [3].

Figure 2 - Mobile App Forecast [3]

App stores are major gateways for app distribution, engaging users and various players of the industry. Mobile devices and apps are the most visible part of the ecosystem. However, there are hundreds of companies that maintain and sponsor these apps before they reach the end user, carrying out activities such as development, user acquisition, monetization, user engagement and others that will be mentioned in this chapter.

As can be seen in Figure 3, app developers have traditionally generated the majority of their revenues through selling their apps, and IAP represented their second-highest income source, followed by in-app advertising. However, IAP and advertising are taking up a growing proportion of their revenues [3].

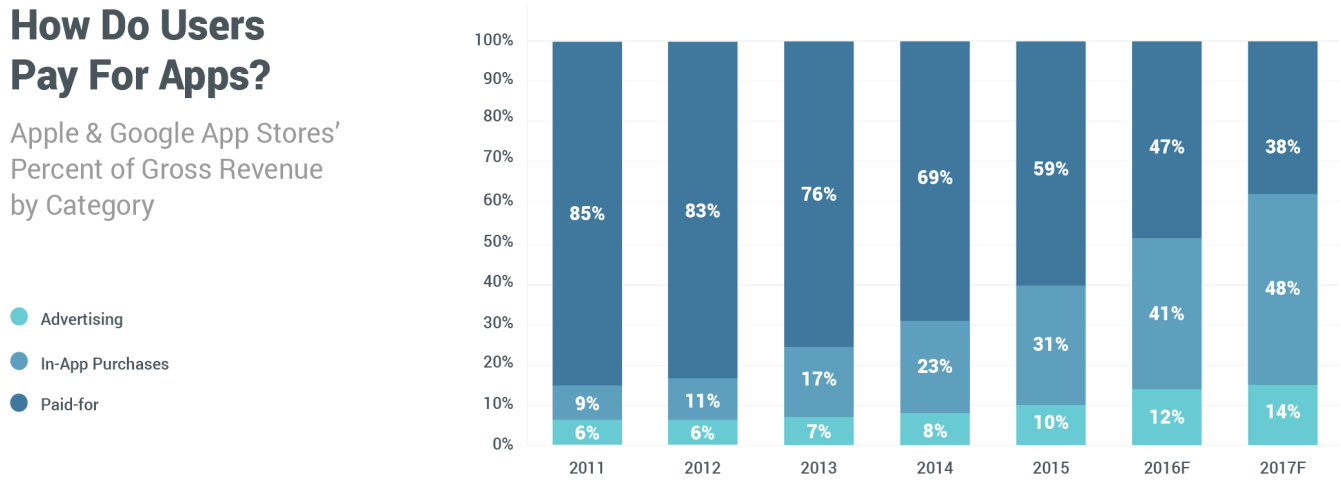


Figure 3 - How do user pay apps? [3]

1.1 Mobile Advertising

About 5% of apps that users download are triggered by app advertising [4]. To improve monetization, most app developers invest in user acquisition.

An overview of the different players in the app advertising market is shown in the following table:

Table 1 – Adtech players in the market [5][6][4][7]

Player	Description	Cost	Purpose	Players Examples
ATD (Agency Trading Desks)	A centralised organisation that manages programmatic, bid-based media and audience buying. Works as an agency's internal group, supporting agency teams	10-15%	Specialised service focused only on media buying	Xaxis from WPP, Affiperf from Havas
DSP (demand side platform)	Interface where advertisers can buy publishers' inventory (usually impressions)	10-20%	Aggregator of channels to publish ads	Google's Invite Media, MediaMath, Turn, DataXu, X+1
SSP (supply side platform)	Interface where publishers manage their inventory (maximising impressions prices)	15-25%	Aggregator of channels with ads	Google, OpenX, PubMatic, Rubicon Project, AppNexus, AOL, Right media
Ad exchange (real time bidding)	Virtual marketplace where publishers make their impressions available for the advertisers to buy through real time bidding	10-20%	To connect DSP/SSPs To connect networks	Google, The Rubicon Project, Open X, AppNexus, Yahoo
DMP (data management platform)	Software that saves and manages any kind of information in order to generate audience segments - then used mostly by DSPs but also by publishers and agencies	10-15%	To provide information about users	Adobe, Krux, Lotame, Oracle, 42matters, Aggregate Knowledge, CoreAudience, Knotive, nPario
Ad Networks	Company that connects advertisers to publishers (supply-demand)	20-40%	To connect publihers and advertisers	YouAppi, Marsmedia, Glispa, Revmob
Tracking/Attribution Platforms	Platform that helps advertisers understand where their traffic is coming from and measure the conversions' success	10-20%	To guarantee that the user is real and without double attribution	AppsFlyer, Kochava
Ad Server	Software that stores data about advertising content and delivers ads	1-5%	To help displaying ads	Google DFP, OpenX, Broadstreet, Adzerk, AdButler, adColt, Revive

In most cases, these intermediaries don’t act all at once. As the below figure demonstrates, each advertising campaign requires a different set of adtech players.

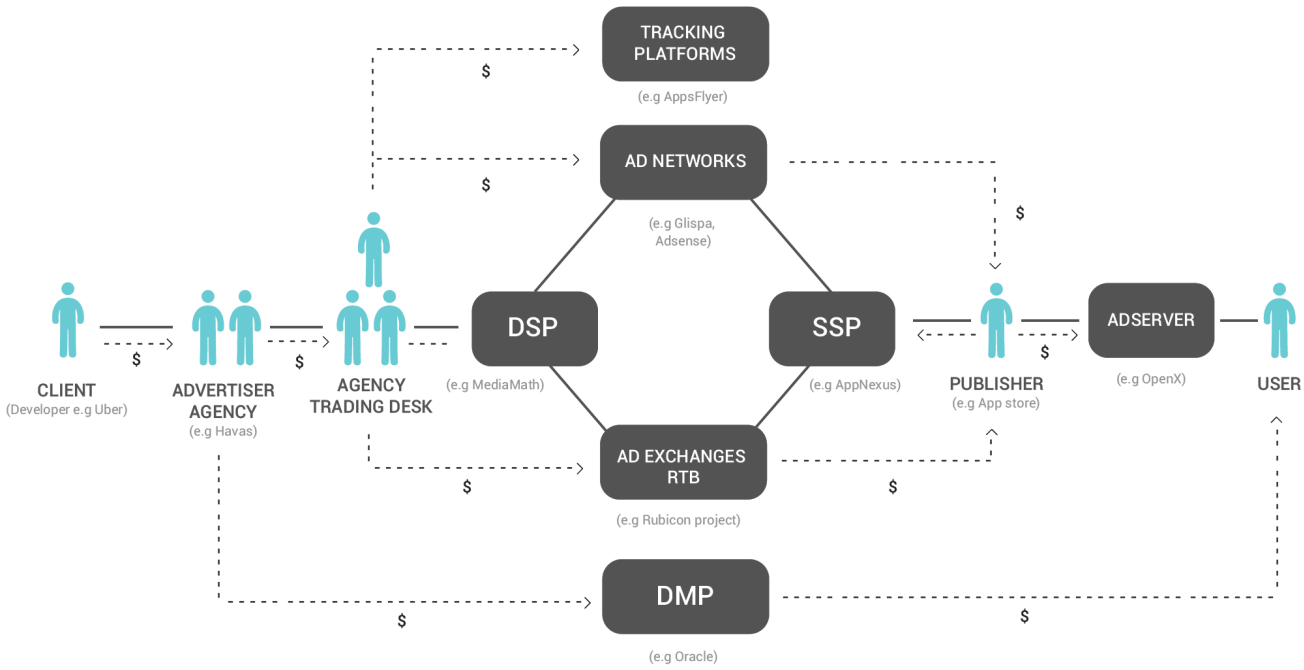


Figure 4 - App Economy Exchanges

Use case example: In order to advertise their app, a client (e.g. Uber) hires an advertiser agency such as Havas. The advertiser agency offers a specialized trading desk, offering media-buying processes (analyzing the bidding prices, placements and campaigns performance). The agency's trading desks connect with a DSP (Demand Side Platform) such as MediaMath to find the best placements, biddings and targeting (gender, age and website categories). DSPs use the data provided by DMPs (Data Management Platform) to acquire the right audience and their information.

As ad exchanges are virtual marketplaces, ad requests by advertisers bid for available ad placements by publishers. The campaigns will be offered on SSPs (Supply Side Platform) such as AppNexus, where publishers can optimize their placements through campaign management. Ad Networks such as Glispa synchronize advertisers and publishers by buying placements, optimizing them, buying traffic from publishers (app stores) and thus guaranteeing that the advertisers' campaigns are carried out more efficiently and more profitable for both sides.

Due to competitive market forces, players are encouraged to utilize attribution platforms that evaluate whether ad campaign results are reliable and whether conversions are successful.

Too many cooks spoil the broth. While attribution platforms such as Tune and Appsflyer allow marketers to show conversion data (data of newly acquired users' due to advertising), advertisers do not place much confidence in their campaign's success, as too many acting intermediary placers create distrust.

In the past, fraud has been detected in the industry which further eroded marketer's confidence. [8]. More industry awareness is required. In a landscape where apps are free, fraud has been increasingly damaging the advertiser's costs. Brustein indicates that advertisers lose over USD850 million per year to invisible fraud within mobile apps [22]. The fraudulent activity comes from what they consider uncertified apps, which represent 52% of the total space [9]. This raises the question what determines an app to be certified and what methods should be applied for certification. Advertisers need a more transparent ecosystem, in which the ad's cost is spent more effectively.

1.2 In-app Purchases

Of all the monetization strategies, IAP is the top revenue stream in terms of return on investment (ROI), which is why we are focusing on it. As shown before, the share of IAP gross revenue has grown from 9% in 2011 to 48% in 2017.

IAP is an integral part of the so-called freemium model. Initially, apps are downloaded for free, but feature-rich versions or additional services require IAP. As IAP apps can be downloaded for free, they've become the most popular. Research suggests that they will rank highest in terms of revenue totaling USD37 billion in 2017 [3].

As the demand for IAP is high, app developers have created various IAP options, such as upgrades, speed-ups, in-app currency, additional functionality levels, content, more time to use the app, paying to remove ads, or any combination of these. As aforementioned, IAP is a growing monetization strategy.

IAP of digital content in Android is managed through an API. This in-app billing service can only be implemented in applications that a developer publishes through the app store, as the latter handles the connection between the Android application and the app store's server. It is the app developer's responsibility to deliver the digital content sold in an Android app [10].

In-app financial transactions are managed by an app store. Dominant app stores are Google Play as well as the Amazon Appstore for Android devices, and Apple's App Store for iOS devices. As developers want to reach the highest-grossing audiences, they primarily focus on the aforementioned app stores. This leaves developers with narrow choices to generate the maximum profit, as top app stores take up a cut of 30% of IAP [10].

Various entities are involved in the end-to-end (user to developer) transaction to ensure smooth operation and payment processing. This process is resource intensive and a considerable cost burden for the developer.

This is the actual flow and all the intermediaries, when a user purchases an in-app item:

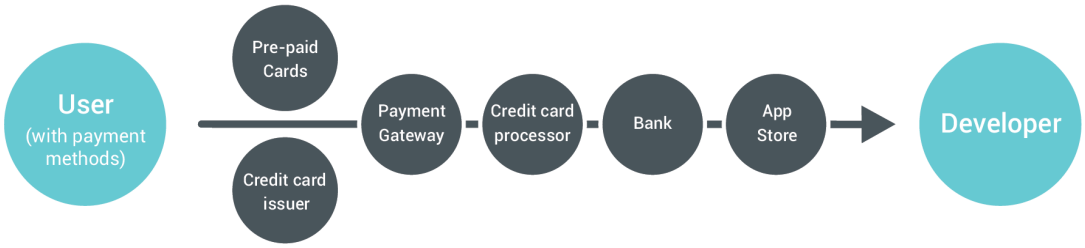


Figure 5 - Current in-app purchase flow

All apps rely on a payments processing company to handle the payment and a bank behind it all. All of these intermediaries take a percentage of the app purchase. Some mobile operators that provide payment solutions take up to 40-60% of revenue [5].

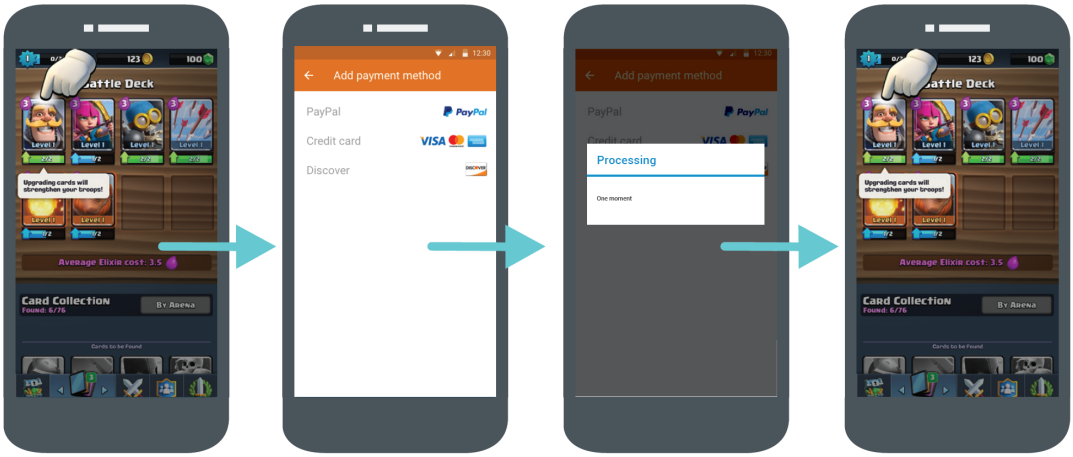


Figure 6 - IAP Example for Payment Flow

Due to the industry's sophistication, low-end users totaling around 2 billion [6] do not have means to make purchases, being deprived from participating in this market because, although they may own a smartphone, don't they don't have payments mechanisms.

1.3 App Approval

Slinglen Jasen and Edwoud Bloemendal define App Stores as: *"An online curated marketplace that allows developers to sell and distribute their products to actors within one or more multi-sided software platform ecosystems"* [11].

Considering the app ecosystem is a set of businesses functioning as a unit and interacting with a shared market for software and services, trust and security are important factors. An app store can be seen as a catalyst as the relationships are frequently supported by a technological platform or "market" and operate through the exchange of this information. App stores bring in end-users and developers to the platform and thus facilitate app monetization [11].

The process of approving apps is different for each app store. There are centralized platforms (stores) such as Apple's App Store, and the Play Store from Google, and more decentralized solutions such as Aptoide app store.

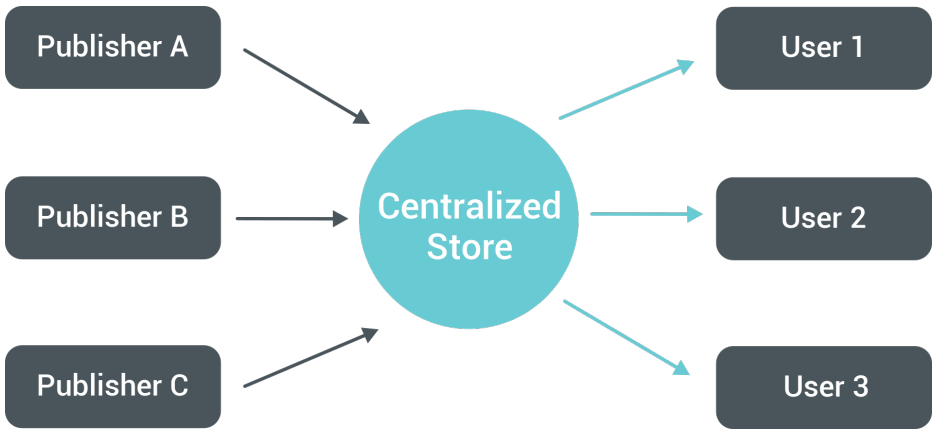


Figure 7 - Example of a centralized store

In a centralized (closed) app store system, the approval method includes quality assurance either from automatic bouncers, or manual procedures, to either reject or accept apps. Each app store has their own distribution policy and guidelines to rank developers and whitelist or blacklist their apps. This brings uncertainty and lack of transparency to the system [12].

On the other hand, decentralized app stores exist in the app ecosystem, such as Aptoide, which provide multi-store platforms where each developer or partner manages their own store (channel) allowing, for example, the app store to be available in pre-loaded devices of OEMs or fulfill the specific needs of Telcos or brands [16].

Centralized or not, app stores base their app rating system on a set of rules and guidelines they define, such as, for example, the country that applications originates from [13]. For example, Google in the US uses the ESRB (Entertainment Software Rating Board) standard, so apps will begin appearing with the familiar “Everyone (E),” “Teen (T),” “Mature (M),” etc. As for countries without specific guidelines, other general ratings are created [13].

Security has, for a long time, distinguished the iOS store from Google Play. The latter was popular for allowing developers to submit applications with lower restrictions [13]. Due to some pressure, even Android’s open model started screening apps before they went live. Google is just an example, as all app stores were forced to figure out how to increase security without it taking an excessive amount of time to approve new apps.

Lack of transparency is a large pain point in the app approval process, as in some app stores, an app undergoes various tests and verifications before it is uploaded. While some apps get rejected and never cross the submission level, others may preliminary pass these screening tests but eventually also get thrown out due to seemingly questionable reasons such as “stringent laws [being] broken”. This is the case for apps such as Snaptube, Tubemate and Videoder [14].

If the developer wants to publish an app in multiple apps stores, he/she needs to submit their app to each app store. This means that the process needs to be unnecessarily duplicated and is, therefore, inefficient. If apps are not compliant, app developers are forced to adapt to each store’s standards.

1.4 Developer’s Perspective and the App Lifecycle

Understanding the life cycle of an app is key to calculate the ROI for a developer. A developer’s goal when launching an app is to reach out to the largest user base possible. To do so, the developer usually invests in advertising, hoping that the user will get the app and purchase items, if the app has IAP, or engage in advertising inside the app in case the app is free. Either way, user retention is essential for an app to be successful.

Figure 8 shows the lifecycle of an app and all the intermediaries it passes through from app launch to end-usage. The main objective of the developer is to monetize through incentivizing the user to invest back in its app via an IAP.

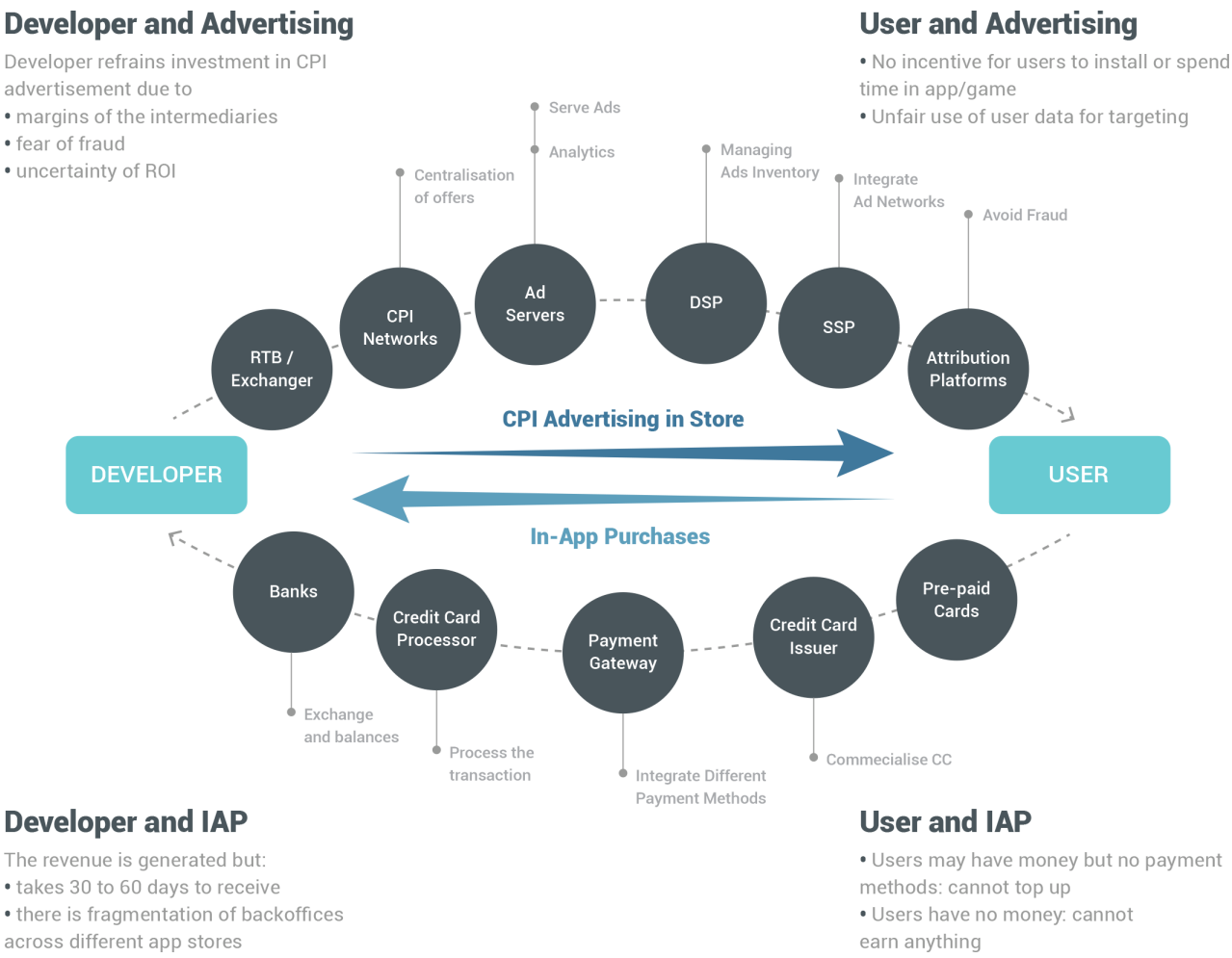


Figure 8 – App Flow

About 65% of developers do not take the right approach and fail to create a comprehensive plan to determine, evaluate and track ROI – leading to failure and missing the right revenue generation plan and profit goals [15].

Based on Aptoide's Publisher Relations team experience, developers measure an app's lifecycle and ROI through the following metrics:

- Clicks
- Installations
- Retention rate
- Conversion rates of paid user acquisition campaigns (shifting towards new players/registrations/purchases, rather than a simple installation CPI)
- Revenues coming from paid user acquisition campaigns
- Associated costs of paid user acquisition campaigns

Developer X's [publisher's name removed for anonymity] app was used to exemplify the typical lifecycle of an app. The advertising investment predates the user installs and IAP.

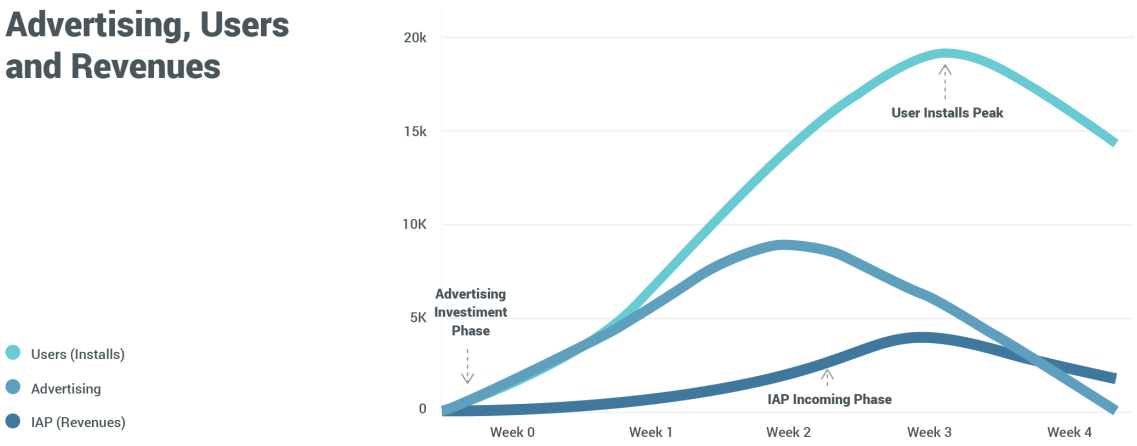


Figure 9 - App Lifecycle

Before developer X launched his/her app on the app store, developer X invested in advertising, on a Cost per Installation (CPI) model.

As Figure 9 shows, advertising started in week 0, even before the app was launched. Once the advertising campaign got traction, the number of app installs and the user base increased. The user base peaked around week 3. The developer's goal was to acquire loyal users coupled with a high retention rate in order to achieve a successful ROI. IAP started to pick up around the 1st and 2nd week, reaching its peak in week 3. At this phase, most of the IAP has been completed by retained users. After the fourth week, the lifecycle of the app was reached and only retained users remained, until developer X decided to invest again in more advertising.

In this particular case, the ROI was positive because the IAP revenue was greater than the advertising spent. The app needs to have a retention rate of over 30% in order to have a positive ROI (Source Aptoide).

2 AppCoins overview

2.1 The AppCoins Solution

AppCoins is an open and distributed protocol for app stores based on the Ethereum blockchain and smart contracts. It redesigns app advertising, IAP and app approval flows through a circular model. As a higher share of the advertising and IAP revenue is kept within the app ecosystem, more value is rooted back to the app economy. Being an open protocol, it provides transparency. As industry players can now comprehend the protocol's workings, it also provides more trust. Multiple app stores can implement and benefit from the open protocol and more stakeholders will contribute to its development and adoption. Furthermore, simple API integration will allow easy implementation.

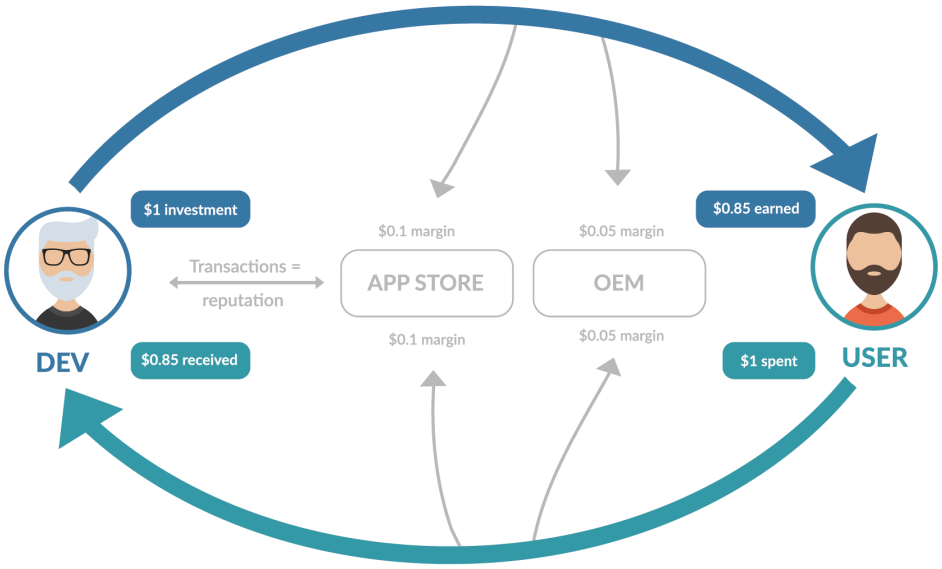
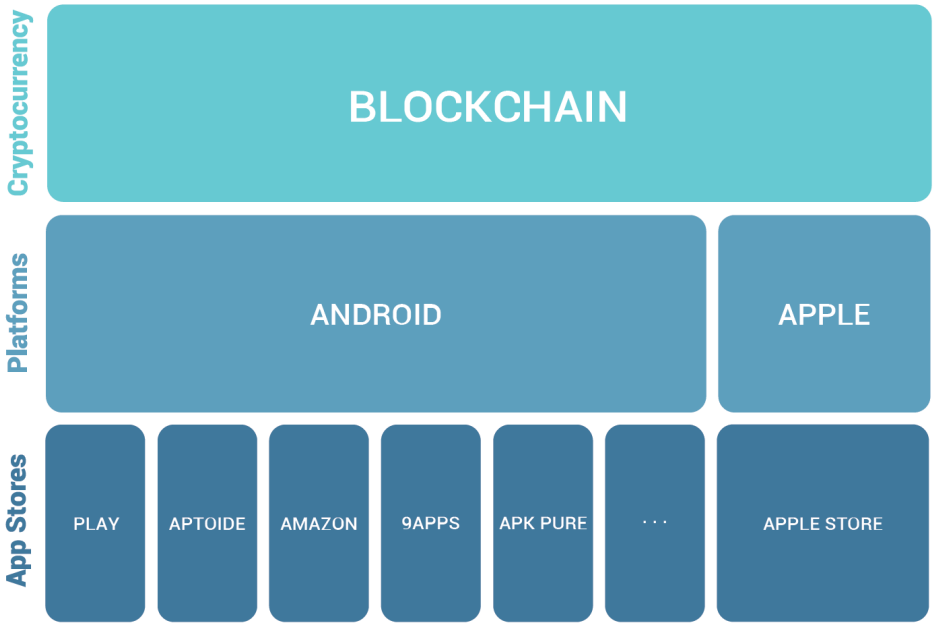


Figure 10 - AppCoins Solution

Through AppCoins we can integrate app stores, users, developers, advertisers and OEMs. This system is app store agnostic, existing across different mobile platforms (Android & iOS). In this system, the different app stores act as oracles of the smart contracts which are associated with each of the platform's core transactions (see whitepaper for details). This system creates a trust layer for the economy, rendering many middlemen obsolete. AppCoins can become the universal language of the app economy.

AppCoins ERC20 tokens will be created during a Token Sale event. The AppCoins financial transactions are associated with respective smart contracts. These transactions are carried out by the different ecosystem actors: users, developers, OEMs and app stores.



Distributed information:
- IAR transactions
- Advertising contracts
- Wallets
- Trusted developers

OEM Shipment:
- Incorporate App Coins supported by App Stores

UI and Discovery features:
- Provisioning of Apps (APK) and distribution agreements
- App discovery
- Wallet management
- Ad campaigns creation

In summary, the protocol includes a novel *Proof-of-Attention* system. Users, app stores, and OEMs receive tokens through the Proof-of-Attention concept as a reward. Developers that want to advertise their apps can be sure that the user has installed and used it. The users reinvest their tokens via IAP. That creates a market efficiency that boosts the AppCoins economic growth.

2.1.1 For Advertising transactions

Developers are willing to pay for app installs (via advertising) but there is fraud and costs of intermediation (ad servers, tracking platforms, etc) are present. With the AppCoins protocol, advertising transactions are on the blockchain. Developers publish ad offers to a certain app store by creating a smart contract. The tracking of the app installation and usage occurs via *Proof-of-Attention* reducing fraud. Each app store acts as the oracle, which unlocks developer's funds through a smart contract.

How it works:

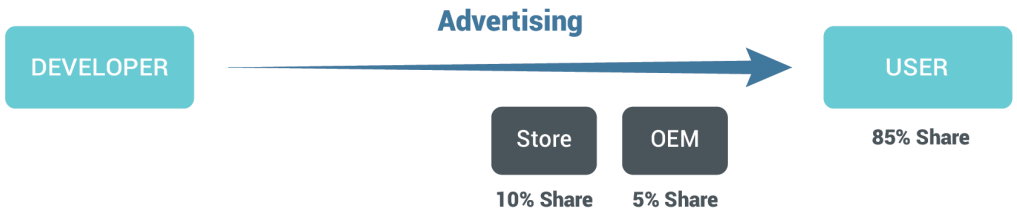


Figure 11- AppCoins Advertising Flow

- The developer pays for the user's attention (CPAt) – defined at a 2-minute threshold.
- The user receives 85% of advertising revenue in their wallet. This value can be used to pay for IAP.
- The app stores will receive 10% of the revenue for distributing the APK and for being the oracle of the smart contract.
- OEMs who distribute the solution in their devices will receive 5% for the role of pre-loading the app stores and bringing their user base to the system.

The app store will validate the time spent in the app without any intermediaries and will record it in the blockchain. Afterwards, a smart contract transfers AppCoins from the developer's wallet to the user's wallet, OEM, and app store.

Example for Advertising (Smart Contract 1)

When the app store (oracle) confirms the user attention (minimum time using the app) it stores the Proof-of-Attention in the blockchain. As soon as this happens, there's a transfer from the developer's wallet to the user's wallet (85%), app store (10%) and OEM (5%). The value of the transfer equals the ad bid.

2.1.2 Increased accessibility on IAP

Users want to buy items inside the App, but often don't have the means (methods or money). AppCoins can be used to pay for IAP in any app store. Users can exchange fiat currency for AppCoins or receive it from other users. They can also earn AppCoins by installing and paying attention to advertised apps. This is an incentive to participate in the app economy.

How it works:

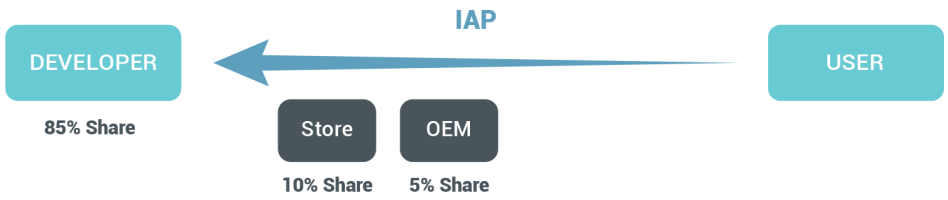


Figure 12 - AppCoin IAP Flow

- The price of each in-app item is catalogued in the blockchain, using the developer's private signature. After the sale, the user can continue to use the IAP item since the proof of payment is on the blockchain. Each user can also send non-consumed items to other users.
- Users buy in-app items with AppCoins earned from advertising, exchanged for fiat currency or sent by other peers (P2P transfers).
- Developers receive 85% of the IAP transaction in their wallet directly from the user's wallet.
- The price can be dynamically established by the developer and may change during the app's lifetime.
- The app stores will get 10% of the revenue of purchases made by users, for the role of distributing the APK and as an oracle of the smart contract.
- AppCoins are independent of the store and can be used elsewhere for apps consumption, even across app platforms.
- OEMs (who distribute the solution in their devices) will receive 5% for the role of pre-loading the app stores adopting this solution.

2.1.3 Developer's Ranking

A developer's reputation is based on their transactional history on the ledger. The reputation of all listed apps is tied to the developer's reputation. It becomes easy to secure the platform since app approval is automated. AppCoins proposes a developer ranking system that will (1) promote transparency in the app approval process of app stores, defining a trust circle with different levels as well as rewards; and (2) a system that promotes the engagement of users in this ranking, performed by a dispute system with incentives. AppCoins ensures an improved experience for users and developers and makes app stores safer from malicious software.

How it works:

The developers' apps ranking system is stored in the distributed blockchain, which the app stores have access to. Management of this "Chain of Trust" is performed by the community/industry, cooperating in an efficient way.

The AppCoins "chain of trust" model exhibits three different types of reputation for developers:

- *Trusted*: The apps of a Trusted developer are considered safe.
- *Critical*: Apps considered not safe, therefore blacklisted.
- *Unknown*: Preliminary status referring to developers before any app has been uploaded. Once an uploaded app is considered safe, the status changes to Trusted. If the app is deemed unsafe, it changes to Critical.

For a **Trusted Ranking**:

- There are different "trusted" rank levels and they will be automatically calculated depending on the amount of IAP and advertising transactions in the blockchain.
- The trusted status is defined by the interaction or volume of transactions of apps and not the downloads.
- The higher the developer engagement in paying for ads, the higher the user engagement, measured both in proof-of-attention and IAP.
- The popularity of apps will influence the trusted ranking of a developer. Top games and apps will by default have more transactions (ads and IAP) and, therefore, will enjoy a higher trusted rank.

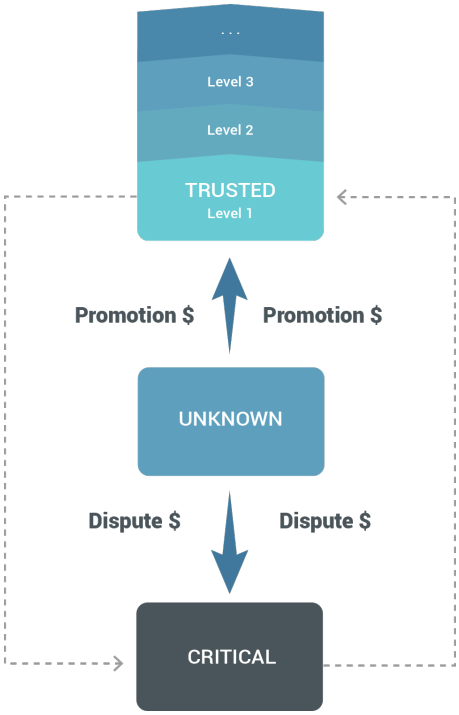


Figure 13 - AppCoins Developer's Ranking

Example:

> A developer uploads and app for the first time, so he/she is classified as Unknown --> creates advertising campaigns to acquire users, thus creating a transaction flow so the ranking moves from Unknown to Trusted --> Developer is ranked Trusted --> User performs IAP transactions in the developer's app --> more transactions --> increases the level of Trusted.

For the **Dispute system** (giving a “critical” classification):

When malware is detected in an app or if a user wants to report a low-quality app, the dispute system will use a consensus protocol to mitigate the dispute. AppCoins will play a critical role in this.

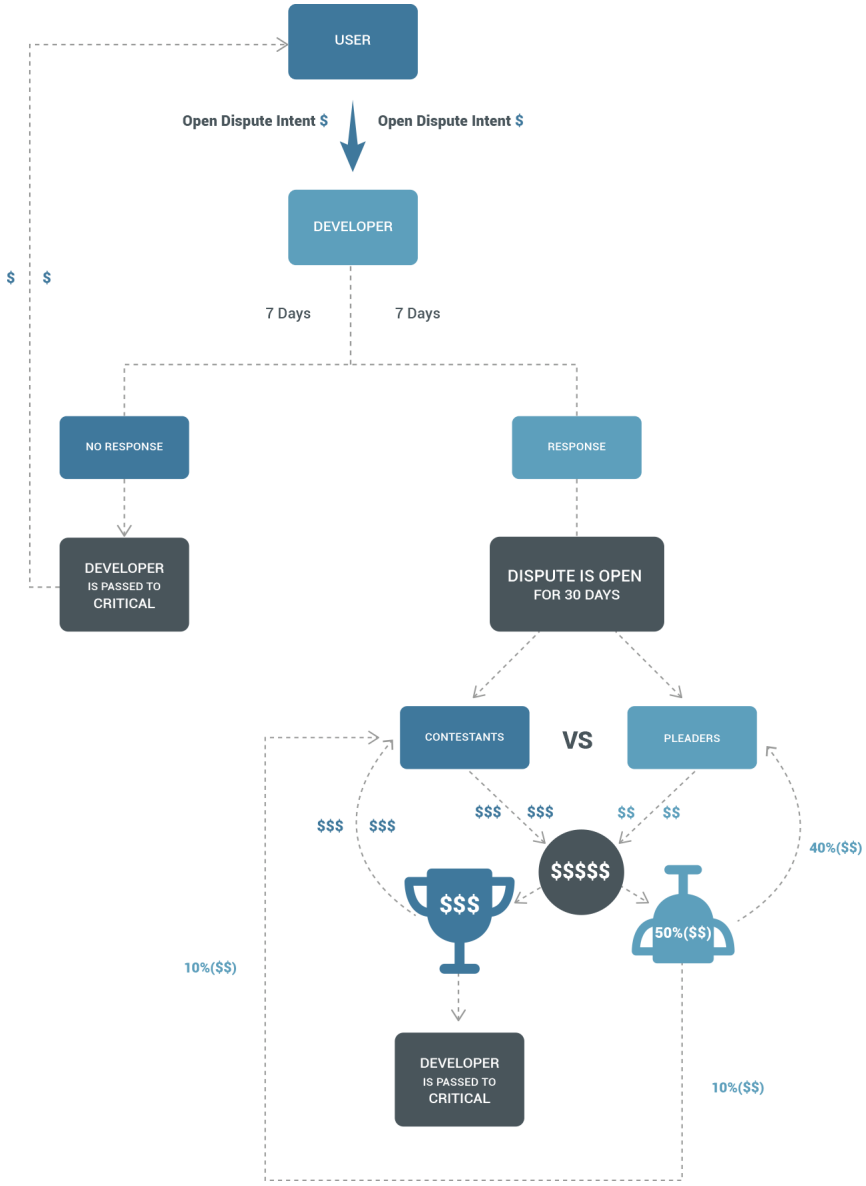


Figure 14 - Ranking Dispute

- The opening of a dispute intent - blockchain will allow 7 days in order for other users to respond to a negative classification (intent).
- In case of no response – the developer's reputation drops down to critical status;
- In case of a response - Person A pays a fee in AppCoins to respond and the dispute is open for 30 days so other users can also respond similarly. The dispute will have 2 sides:
- Contestants (bad ranking side)
- Pleaders (developer's side – who want the developer to keep a good ranking)
- After the 30 days, the side that has most AppCoins will win. If the Contestants side wins, the developer is classified as Critical, if the Pleaders side wins, the developer stays or becomes classified as Trusted, so a 50%+1 evaluation of the side that wins.
- There is an incentive mechanism: the side that wins will get their AppCoins invested in the dispute refunded. The side that loses will also get refunded with the AppCoins

invested minus 10%. The 10% taken out of the “losing side” will be divided by the winning side (proportional to the amount that user put in).

App stores can decide themselves if they want to hide or remove the app if it is classified as critical.

2.2 AppCoins Use Cases

In this section AppCoins use cases for both the consumer and business sides are explained.

2.2.1 Users with no payment system access

Everson

15 year old user with no payment method access

“I have an Android device and I love to play games. I would love to purchase gems on Clash of Clans. 80 of those cost only R$2.99, but I don’t have access to a payment method neither do my parents.”

Facts

In countries like Brazil users still prefer **Bank Transfer (35%)** to **Credit Card (21%)**

AppCoins Benefits

Everson can obtain AppCoins from his friends or by trying other apps

Everson has an Android smartphone and loves to play games. He would love to purchase in-app items. But the problem is that he doesn’t have a credit card or an easy way of sending money to his game wallet.

Consumers in emerging economies such as Brazil still prefer to rely on bank transfer (35%), credit/debit card (21%) and mobile carrier billing/SMS (16%) for in-app transactions [16]. Digital wallets account for only 15% of all transactions. Few of Everson’s his friends have a credit card. Even fewer do payments online, although he and his friends all own smartphones.

The father of one of his friends has a credit card and is able to pay through his phone. Everson’s friend offers to send him 10 App Coins in exchange for real money. All he has to do is install an AppCoin affiliated App Store. Then he can start using his AppCoins through their IAP system on his favorite Android games.

2.2.2 Users with low financial resources

Arun

User with low financial resources

"I can't afford to do in-app purchases, but I love trying new apps. I also have a Youtube channel, and if possible I would like to share my opinions about apps and in-app items!"

Facts

In India **only 3%** of users do in-app purchases.

AppCoins Benefits

Arun can receive coins for trying new apps, which allow him to try in-app item purchases

Arun has a small Youtube channel talking about Android apps. Most of his audience are his friends. He's always looking for free alternative apps to well-known tools. Arun also looks for freemium games that he can play offline. Arun doesn't have a lot of money to spend. Many of his followers on Youtube ask him to review premium features of apps, but he is unable to buy them. If only he could earn some free credit to unlock those features through IAPs. In India, only 3% (compared to 5% globally) of smartphone app users buy in-app items [17].

These problems are solved once he tries AppCoins. Now he plays an important role in the app economy. AppCoins value his willingness and availability to try new apps and games. The more time he spends using new apps, the more credits he obtains.

2.2.3 Indie Developers

Growstrong Studios

Indie Developer

"We want to ensure our Marketing expenditures have results."

Facts

Developers have a hard time being noticed. The **1000th** most popular app has only **0,2%** of the market.

AppCoins Benefits

Growstrong Studios can obtain a much higher ROI on mobile advertising.

Growstrong Studios is an indie developer. They have been doing paid advertising on app stores to acquire new users. They have noticed two different patterns: 1. A lot of traffic is fraudulent, as the installs they are receiving are not real users; and 2. Many of the real users don't spend more than a few seconds on the app. So far, all of their marketing investment has been wasted.

Mobile app developers still suffer from App Discovery issues, especially indie developers. The 1000th most popular app in the market only has 0,2% of the users [18]. Breaking through the noise is still the no. 1 issue faced by indie developers. Current mobile advertising is not a solution either. Mobile ad fraud losses may reach $16.4 billion in 2017 [19]. A lot of mobile advertising is ineffective; only 4% of app installs are triggered by advertising. Also, ad fraud practices such as false clicks and installs are rampant.

After testing AppCoins, Growstrong Studios conclude that it makes it considerably difficult to fake installs or actions. This reduces fraud. It also guarantees that the users at least try the app, increasing the chances of retention. To further boost retention, they even award the user a few AppCoins for the install and attention. They can even run promotions for these users. For instance, they can offer them items with a special AppCoins price. It's a win-win.

2.2.4 Top Developers

Mega
Top Developer

"We want to optimise our monetisation efforts and improve our R&D processes."

Facts

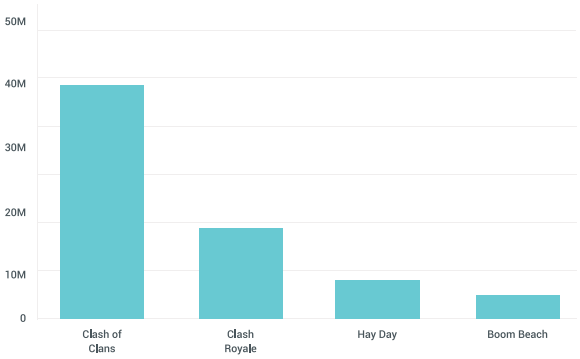
Top developers have unbalanced app portfolios. **Very few apps earn most revenue.**

AppCoins Benefits

Mega gets a more efficient monetisation and user acquisition process.

Mega is one of the top developers in the world. It has an app portfolio that includes mobile games that rank amongst the top 100 most popular. It keeps introducing new apps in the market, but it's getting harder to get these new games noticed. The market is overcrowded and the acquisition efforts are very costly. In the meantime, Mega's cash cows won't last forever. Despite being a top developer they still run the risk of losing market share to the app economy's long tail.

Data from Google Play Store suggest that some top developers may have unbalanced app portfolios. More than half of Supercell's downloads are from a single game.



Mega's new app development processes can be improved with the extra cash flows coming from the AppCoins economy. This allows them to put better apps in the market faster. Users also have more financial power to enjoy the paid in-app experiences.

2.2.5 Independent App Stores

MainApps
Independent App Store

"We want to improve our quality assurance processes and verify the reputation of developers beforehand."

Facts

Independent app stores are a large part of the industry. The **revenue** of independent app stores combined **matches Google Play's**.

AppCoins Benefits

MainApps obtains a standardised and transparent quality assurance system.

MainApps is an independent Android app store that has a critical issue: the difficulty to confirm the identity of developers. They need to confirm these identities to control the quality of new app uploads. To solve that, they have their own quality assurance process, but that process is only partially automated.

The combined revenue of independent App Stores in 2017 nearly matches Google Play's revenue at $20 Billion [20]. These are important players which have struggled with app quality issues [21].

AppCoins allows MainApps to check the blockchain to determine the developer's reputation based on previous transaction data and disputes. This way, MainApps can benefit from a standard transparent global quality assurance system.

2.2.6 Regional App Stores

Markyt

Regional App Store

"We want access to the best app content from top developers, but top developers don't fell secure uploading their apps to regional app stores."

Facts

99% of **app store revenue** in **China** comes from **regional app stores.** Regional stores are also important in Russia, India, S. America and M. East.

AppCoins Benefits

Markyt has an easier access to top content.

Markyt is a regional Android app store. One of the main problems that it faces is the difficulty in obtaining access to global content. They have very good relations with local developers, and they have good processes to certify their identities, given that there are fewer. The main problem is getting global top developers to submit their own content to an app store they don't know, especially given the difficulties with their QA processes.

Approximately 99% of the app economy revenue in China comes from regional app stores [22]. Regional app stores are important in regions such as Russia, China, India, South-America [23] and Middle-East [24]. They all experience problems with lack of access to AAA content.

AppCoins is a trustworthy environment where top developers are open to submit their content to different app stores. They don't need to create special versions of their content to process IAP anymore. This gives developers access to leads in specific geographies. AppCoins provides a standardized interface for developers to receive payments in any app store. Top developers now have a reason to trust Markyt and are willing to try out these new app stores, since app distribution is simplified and in return they can earn more profits.

2.2.7 OEMs

Truepad
OEM

"We want to establish partnerships with large independent app stores to extend the content catalog of our app store, given that our devices don't have Google Services."

Facts

China's smartphone OEM 'Big Four' hold **22,1%** of global vendor market.

AppCoins Benefits

Truepad has easier access to app store partnerships, and a 5% share of the transactions.

Truepad is one of the largest equipment manufacturers in the world. It enjoys a strong market share in the Android tablets market and sells millions of devices from Shenzhen to the world. It also has its own Android app store that comes pre-installed, TrueApps, because that way the company can avoid using Google Services (which provides a low return for them). In theory, Truepad could get a large number of apps given its reputation as an OEM, but developers prefer to upload their content to the well-known stores. The company's main issue is attracting new and updated content to make their app store useful to their devices.

The Smartphone OEM "Big Four" in China hold 22.1% of the global vendor market share [25]. They've been left out of the app monetization payoff, but they are one of the main drivers of the app economy growth.

AppCoins allows Truepad to monetize its users through the OEM share included in the smart contracts. It also allows the OEM to scale its content offer by partnering with app stores. The AppCoin protocol allows it to integrate with different app stores and monetize on their large user base. Truepad still keeps its own proprietary app store and catalog while generating leads for existing app stores.

3 Analysis of AppCoins Model and Impact

3.1 Transparency and Openness

The mobile attribution model assumes the advertiser and the publisher don't trust each other. Thus, it relies on a third party to confirm the advertising results. AppCoins renders the third party obsolete through Proof-of-Attention, with costless built-in transparency enforced by the underlying blockchain. Costless verification is one of the main benefits of blockchain-based financial systems [26].

Additionally, AppCoins transactions rely on publicly available smart contracts. It means that all parties have the mathematical assurance that they can trust each other. Privacy is also safeguarded: cryptography ensures that we can verify transactions without accessing private data. When we have a trustworthy system that also ensures privacy we are facing a truly open economy, which eliminates transactional risks that currently exist. It also creates a safe plug-and-play environment for open innovation from firms.

Recent research suggests that open innovation fosters knowledge spillover effects between firms. This has a positive net effect on overall economic performance [27]. Existing open platforms such as Android have generated higher levels of innovation [28]. Android, in particular, has achieved market leadership very fast (86% as of 2017 [29]). AppCoins' transparency and openness should boost innovation in the app economy in a similar manner.

3.2 Closing the Loop Towards a Circular Economy

One of the central aspects of the AppCoins business model is its circular economy. Value previously drained by intermediaries now stays in the system, as a means for users to be active in the app economy. This conception aligns with circular economy principles, bringing huge financial, social and environmental benefits. The circular economy has attracted the attention of major global

companies like Google, Unilever and Renault [30]. Global economies are transitioning from the linear model (“take, make, dispose” [31]) to the circular model (“closing loops” [30]). The Ellen MacArthur Foundation estimates the potential impact on the net savings of the EU to be $630 billion per year [32]. This led the EU to recently provide funding to support it: over €650 million under Horizon 2020 and €5.5 billion under the structural funds [33]. Despite being associated with manufacturing, these benefits are being transposed to the digital economy, as shown in Google’s case study [34].

The principles of the circular economy include, among others, the need to **build resilience**, to **think in systems** and to **share value** [30]. Figure 15 shows the envisioned transition of the app economy towards a Circular App Economy using AppCoins.

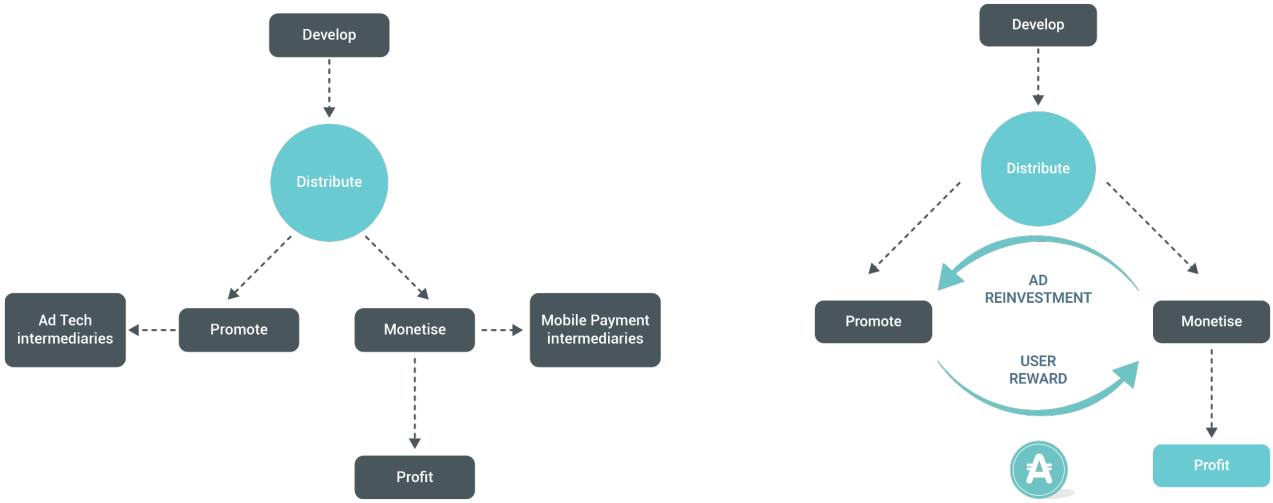


Figure 15: AppCoins closing loops towards a Circular App Economy

The current app economy has gaps. It has no way of reusing resources or building resilience into the system. There are several capital drainers, which prevent the economy from growing optimally. These capital drainers are the payment industry and adtech middle-men. They offer very low efficacy and efficiency. Currently, only 4% of app downloads are triggered by advertising, and only 5% of monthly active users make purchases in the app economy [35]. Therefore, there is no reuse of value within the system, and little value is brought to the key players of the economy: the developers and the users.

On the next section, we present a business case that provides a clear vision of the benefits of moving from the current app economy to a circular economy like the one proposed by AppCoins model.

4 Business Case

The app economy focuses on a global high-volume market that is still growing fast. This business handled 149.3 billion app downloads in 2016, a number that is expected to more than double by 2020 [36]. In March 2017, the Google Play Store had 2.8 million apps available, Apple's App Store had 2.2 million, and the Amazon app store had 600 thousand [37], while Aptoide currently has more than 1 million. Despite being able to encompass the whole app economy, the AppCoins project will focus on the Android market first, which, by the last quarter of 2016 had a market share of 81.7% [38]. In terms of value, the apps market was, by 2016, a $88.3 billion industry, a value that is expected to more than double by 2020 [39]. However, the app economy has the several inefficiencies previously presented, namely the heavy intermediary services that add little value to the key stakeholders, and the very low percentage of users able, or willing, to pay for apps or purchase in-app items. In the following business case, we provide grounded forecasts for the launch of AppCoins in the app economy, and its impact. We focus on: a) AppCoins users' adoption; b) In-store app advertising; c) IAP; and d) The added value to the app economy from the perspective of users, developers, app stores, OEMs, and also adtech and payments industry.

4.1 AppCoins adoption

The evolution of AppCoins adoption is based on several factors. The first is the **support of Aptoide**, a successful European app store with 200 million cumulative unique users. This app store will foster the initial adoption of the system by integrating the platform and by promoting AppCoins to its users, developers, and partners. A second factor is the creation of the **App Store Foundation**. As described in the next chapter, this foundation will have the aim of building, through open governance, a community of app stores that, by adopting AppCoins and by offering it to its user base, will significantly increase the number of users adopting the system. The other factors that will influence the adoption of AppCoins are the characteristics of the model itself. Some examples are the **users' compensation**, not found in other app stores, which has the ability of bringing new user segments to the app economy (users without money or payment methods), and the **trust** that comes from blockchain's security and transparency features. Another key characteristic of the AppCoins model is the **reduction of the intermediation** of the adtech industry. This action tends to lower the

costs of app advertisement to the developers, fostering their adoption and of the users of their apps. We envision that these disruptive characteristics, associated with the network effects mentioned in the Annex of this document, will be able to foster the **organic growth of the user base**, engaging new users and attracting users from the competition.

Table 2 - Users' Adoption of AppCoins

	Month 6	Month 12	Month 18	Month 24	Long Term (Month 60)
	Beta users	*Early Adopters: Aptoide App Store*	*Consolidated bootstrap strategy results*	*App Store Foundation: First set of app stores' community*	*40% of the whole apps industry*
Monthly Active Users (MAU) Forecast	**10 000**	**18 000 000**	**41 000 000**	**95 000 000**	**1 300 000 000**

To support the previous assumptions we have built a *Bass Diffusion Curve* (a consumer growth model [40][41]) able to forecast the progression of the users' adoption with the following parameters:

- Seed value of 10 000 MAU, which will be achieved with Aptoide's initial support.
- Word of Mouth (WoM) effect parameter below average: $q = 0.083$ (average of the market is $q = 0.380$).
- Paid advertising effect below average: $p = 0.001$ (average of the market is $p = 0.030$).
- Baseline forecast for the number of users in the app economy accordingly to Statista [42].

The WoM parameter below average, the low paid advertising and the low number of early adopters (considering Aptoide's support), grants the forecast shown in Table 2 a conservative perspective. Table 2 may be read and explained as follows:

1. 10 000 beta users by the 6th month after the beginning of the project;
2. 18 million early AppCoins' adopters by the 12th month, leveraging on Aptoide's support;
3. 41 million users when the bootstrap strategy is consolidated (18th month), following the strategies described in section 7.2. At this moment, the App Store Foundation assumes the governance of the project;
4. 95 million MAU by the 24th month, based on Aptoide's MAU, the bootstrap strategy completion and on the efforts of the App Store Foundation for engaging 4 to 6 app stores;
5. 1.3 billion MAU in the long-term: after 5 years, we aim to have 40% of the mobile apps market adopting AppCoins, which is coherent with the Bass Diffusion Curve model previously described.

4.2 In-store App Advertising

In the Apps Advertising, we propose to reduce the intermediation of the adtech industry, transferring its value (its revenue share) to users, giving them the means to be more active and engaged in the apps economy. We have thus built the following assumptions:

a. **Users will do more installs triggered by ads** than they do today in order to earn AppCoins, which they can use to purchase items in apps. Currently, based on Aptoide's business intelligence data, only 4% of the apps downloaded are triggered by ads. However, studies from 2017 show that a user is 27% more likely to convert when being rewarded to watch an ad [43]. Therefore, conservatively, we forecast a gradual increase from the 4% of current CPI model, to achieve 27% of downloads triggered by AppCoins ads at the limit of our timeline (5 years).

b. Due to the reduction of intermediaries, **developers will immediately pay less** per attention (CPAt) than they pay currently per install (current default CPI model). The adtech industry is not transparent but, as previously shown, their share is between 40% and 70% of the value paid by developers. Moreover, currently, the average CPI on the Android market is $0.53 [44]. Conservatively, due to the disintermediation, we have assumed an average CPAt 30% below the current average CPI.

c. Due to its added value to the market (more downloads triggered by ads; more users doing IAP) we assume that from the 12th month onwards, **AppCoins' CPAt value will equal the rate of increase of conversions** (percentage of downloads triggered by ads). This is a conservative perspective, based on the higher demand of App Advertising services when these prove their benefits.

d. Currently, each user makes an average of 8.33 downloads per month (Aptoide's business intelligence source).

e. A forecast of the number of transactions and revenue without AppCoins has been achieved considering the current known facts (4% of downloads triggered by ads and $0.53 of average CPI).

Table 3 - App Advertising Monthly Transactions and Revenue

		Today	Month 6	Month 12	Month 18	Month 24	Long Term (Month 60)
In-store Apps Ads	MAU		10 000	18 000 000	41 000 000	95 000 000	1 300 000 000
	Average CPAt (assumption b. and c.)	$0.53	$0.37	$0.40	$0.42	$0.43	$0.48
	Number of monthly app downloads (assumption d.)		83 333	150 426 767	346 715 342	790 805 442	10 895 749 417
	% of downloads triggered by AppCoins ads (assumption a.)	4%	6.3%	10.9%	15.5%	20.1%	27%
	Number of monthly ads transactions (downloads triggered by ads)		**5 250**	**16 396 518**	**53 740 878**	**158 951 894**	**2 941 852 343**
	Monthly revenue of in-store apps ads		**$1 948**	**$6 502 842**	**$22 597 577**	**$68 736 775**	**$1 403 658 680**
	Transactions without AppCoins		*3 333*	*6 017 071*	*13 868 614*	*31 632 218*	*435 829 977*
	Revenue without AppCoins		*$1 767*	*$3 189 047*	*$7 350 365*	*$16 765 075*	*$230 989 888*

Table 3 uses the previous assumptions and known data to forecast the progression of in-store app advertising transactions and revenue with AppCoins. The forecast shows that despite the reduction of the price of CPAt when compared to current CPI models (lower costs for developers), after 12 months the monthly revenue with AppCoins more than doubles the current revenue of in-store App Advertising. After 24 months, the monthly revenue with AppCoins is 4 times bigger than the revenue without AppCoins. Even if the market revenue doubles as it is forecasted [39], AppCoins will still have a revenue that is twice as large. Moreover, in the long term, the difference between the AppCoins model and current the default CPI model still sharpens.

Note: 85% of the share of the previous revenue goes to the users, who have to spend the value earned in the app economy.

4.3 In-App Purchases

Considering app advertising as the economic flow that will have most of the related value redirected to promote users' activity in the app economy, the IAP is where this activity takes place. Figure 10 depict the flow between app advertising and IAP, in the AppCoins loop (or reuse). To support the business scenario, we have built the following assumptions. With AppCoins:

a. **On average, each user will spend more on IAP.** We assume that this will happen due to the more trustful and transparent environment, and the improved engagement (akin to gamification) of the users with the system through its compensation mechanism. Currently, the average IAP per paying user in the Android market is $6.19 [45]. Adding to this value, users will have the earned AppCoins available, equivalent to 85% of the ad conversion related revenue (starting with the CPAt $0.37 - Table 3 -, where users will receive $0.31 per ad triggered conversion). We assume that, with AppCoins, the **average IAP per paying user** will be equal to the current average IAP per paying user plus the AppCoins earned by each user per month (85% of the CPAt multiplied by the number of AppCoins' conversions per user). Given that the CPAt will increase (Table 3), the average IAP per paying user will also increase (proportionally). Table 4 shows this scenario, which conservatively leads to a moderate increase in the average IAP per paying user. This is coherent with the larger user base engaging in IAP, which is the strongest argument of AppCoins model.
b. **The percentage of users engaging in IAP will increase**. This growth is one of the goals and strengths of AppCoins. The system is more inclusive, allowing users that do not have money or payment mechanisms to earn value to spend in the economy. Moreover, users have to spend all the AppCoins earned in the app economy. Given that studies from 2017 show that a user is 27% more likely to convert when being rewarded to watch an ad [43], we envision a growth of the percentage of MAU engaging in IAP from the current 5% [35] to 27% by the end of our forecast period (5 years). This growth is also sustained with a similar growth of the percentage of downloads triggered by ads. Given that users have to spend the earned AppCoin tokens (for anti-fraud reasons, explained in the white paper, users cannot exchange earned AppCoins per fiat money), we assume that there is a direct correlation between these two variables (percentage of users engaging in IAP and percentage of downloads triggered by ads, which leads to the earning of AppCoins).
c. The forecast of the IAP revenue without AppCoins has been achieved considering the current known facts (5% of MAU engaging in IAP and $6.19 as average monthly IAP per paying user).

Table 4 - Monthly In-App Purchase Transactions and Revenue

		Today	Month 6	Month 12	Month 18	Month 24	Long Term (Month 60)
In-App Purchase (IAP)	MAU		10 000	18 000 000	41 000 000	95 000 000	1 300 000 000
	Average IAP per paying MAU (assumption a.)	$6.19	$6.36	$6.50	$6.65	$6.81	$7.10
	% of MAU doing IAP (assumption b.)	5%	7.2%	11.6%	16.0%	20.4%	27%
	# MAU doing IAP		720	2 093 941	6 656 935	19 358 917	353 022 281
	# of IAP Transactions		**3 066**	**5 772 778**	**13 854 745**	**32 853 221**	**478 541 314**
	IAP Revenue		**$4 576**	**$13 602 673**	**$44 279 695**	**$131 750 654**	**$2 507 347 587**
	Revenue without AppCoins (assumption c.)		*$3 095*	*$5 586 850*	*$12 877 008*	*$29 370 514*	*$404 668 133*

Based on the assumptions and facts shown, Table 4 presents the business case related to the IAP evolution. As can be seen, after 12 months, the IAP related revenue more than doubles and after the 24th month the IAP revenue with AppCoins is 4 times larger than the revenue without this model, which grants an unquestionable added value from AppCoins, even considering the potential growth of the IAP market as it is (that, according to the several sources previously mentioned, is expected to double by 2020).

4.4 AppCoins added value to the App Economy

To illustrate AppCoins' added value to the app economy, we need to compare the new distribution of value with the existing one. In regard to mobile app advertising, the revenue share difference is the following:

Before AppCoins	With AppCoins
Adtech industry: 40% to 70% App Stores: 30% to 60%	Users: 85% App Stores: 10% OEMs: 5%

Regarding IAP, currently the value paid by the users when purchasing something in an app has the following distribution of shares:

Before AppCoins	With AppCoins
Payments industry: 2.5% to 5% App Stores: 20% to 30% Developers: 65% to 77.5%	Developers: 85% App Stores: 10% OEMs: 5%

With AppCoins, the shares are defined in public smart contracts, which brings transparency and trust to the economy. In both cases, OEMs will have a share of 5% to foster the wide market adoption of AppCoins. By providing app stores powering AppCoins by default on their devices, these entities are seen as key drivers for AppCoins' success.

With the revenue share distributions mentioned above, and the revenues of app advertising and IAP shown on previous tables it is possible to provide the following table that consolidates the incomes of the key players in the app market.

Table 5 – Consolidation of monthly income shares with AppCoins

		Month 6	Month 12	Month 18	Month 24	Long Term (Month 60)
	MAU	10 000	18 000 000	41 000 000	95 000 000	1 300 000 000
Users monthly earnings	Users share on ads transactions	85%				
	Compensation generated	**$1 656**	**$5 527 416**	**$19 207 940**	**$58 426 259**	**$1 193 109 878**
Compensation before AppCoins		$0	$0	$0	$0	$0
Developers monthly incomes	Developers share on IAP	85%				
	Developers IAP revenue	$3 890	$11 562 272	$37 637 741	$111 988 056	$2 131 245 449
	Average CPI savings in ads due to AppCoins	$835	$2 187 312	$5 885 088	$15 507 728	$155 523 062
	Developers revenue with AppCoins	**$4 724**	**$13 749 583**	**$43 522 829**	**$127 495 784**	**$2 286 768 511**
Compensation before AppCoins		$2 631	$4 748 823	$10 945 457	$24 964 937	$343 967 913
App stores monthly incomes	Ads transactions share	10%				
	IAP transactions share	10%				
	App stores ads revenue	$195	$650 284	$2 259 758	$6 873 678	$140 365 868
	App stores IAP revenue	$458	$1 360 267	$4 427 970	$13 175 065	$250 734 759
	App stores revenue with AppCoins	**$652**	**$2 010 552**	**$6 687 727**	**$20 048 743**	**$391 100 627**
Compensation before AppCoins		$1 591	$2 871 346	$6 618 102	$15 094 894	$207 978 065
OEMs monthly incomes	Ads transactions share	5%				
	IAP transactions share	5%				
	OEMs ads revenue	$97	$325 142	$1 129 879	$3 436 839	$70 182 934
	OEMs IAP revenue	$229	$680 134	$2 213 985	$6 587 533	$125 367 379
	OEMs revenue with AppCoins	**$326**	**$1 005 276**	**$3 343 864**	**$10 024 371**	**$195 550 313**
Compensation before AppCoins		$0	$0	$0	$0	$0

To conclude, with AppCoins the key players in the market - the developers and the users - are the ones being best compensated. Specifically, the developers, who are the creative producers in this market, are the ones with the biggest revenue share. Moreover, according to AppCoins model, the compensation generated to the users will be, by default, reused in the apps economy (in IAP).

Table 6 - Monthly App Economy Losses and Incomes

		Month 6	Month 12	Month 18	Month 24	Long Term (Month 60)
	MAU	10 000	18 000 000	41 000 000	95 000 000	1 300 000 000
Adtech industry losses	Current Adtech share in app advertising (Min)	30%				
	Current Adtech share in app advertising (Max)	60%				
	Average Adtech losses	**$795**	**$1 435 071**	**$3 307 664**	**$7 544 284**	**$103 945 449**
Payments industry losses	Current payments processing fees share (Min)	2.5%				
	Current payments processing fees share (Min)	5%				
	Average payments processing losses	**$116**	**$209 507**	**$482 888**	**$1 101 394**	**$15 175 055**
AppCoins App Economy income	Users earnings	$1 656	$5 527 416	$19 207 940	$58 426 259	$1 193 109 878
	Developers income	$4 724	$13 749 583	$43 522 829	$127 495 784	$2 286 768 511
	App stores income	$652	$2 010 552	$6 687 727	$20 048 743	$391 100 627
	OEMs income	$326	$1 005 276	$3 343 864	$10 024 371	$195 550 313
	Total incomes with AppCoins	**$7 359**	**$22 292 827**	**$72 762 361**	**$215 995 158**	**$4 066 529 329**
	App Economy Monthly Balance (incomes - losses)	**$6 447**	**$20 648 249**	**$68 971 809**	**$207 349 480**	**$3 947 408 824**

Table 6 shows the balance between the losses that result from the disintermediation from the adtech industry and the payments industry, with the incomes/earnings generated by AppCoins for developers, users, OEMs and app stores. This balance is highly positive: more than $20.6M per month after the first year, more than $207M per month after the second year, and in 5 years, the balance will be larger than $3.9B.

4.5 Investment Return and Market Cap

A blockchain platform's value is likely to follow Metcalfe's Law [46] (more details in the Annex to this document). This means that the growth of the value of the cryptocurrency is tied to its user adoption, which was estimated before. Since AppCoins is simultaneously a platform and a cryptocurrency, when we forecast its value we are actually forecasting its market cap. Therefore, at the end of the 5-year period, its value should be around $20 billion, reaching close to $70 billion by April 2024[1].

Figure 16 - AppCoins Adoption and Value Growth

[1] We assumed as constant of proportionality for the Metcalfe's Law, the same value of the Ethereum blockchain in a recent study [46], which is the base for AppCoins.

We can then assume that the AppCoins' token price fluctuates considering the **AppCoins market cap** and the **AppCoin tokens supply in circulation**. The AppCoin tokens in circulation are the ones used for transactions by users and developers (see section 7 for further details about token allocation). Initially, this is mostly tied to the bootstrap coin distribution, but also to market demand for AppCoins, which bring more tokens into circulation when stakeholders such as investors sell them to the public. We are also assuming that AppCoins will have a mechanism to control the supply of tokens in the market, while still allowing for users and developers to exchange fiat currency (however, due to anti-fraud measures presented in the white paper, users cannot exchange AppCoins earned per fiat money). On the table below we present the expected AppCoins supply over time and the expected market cap.

Table 7 - AppCoins Appreciation Analysis

	Crowdsale	Month 6	Month 12	Month 18	Month 24	Long Term (Month 60)
		Beta users	*Early Adopters: Aptoide App Store*	*Consolidated bootstrap strategy results*	*App Store Foundation: First set of App Stores*	*40% of the apps industry*
Monthly Active Users (MAUs) Forecast		**10 000**	**18 000 000**	**41 000 000**	**95 000 000**	**1.3 Billion**
Tokens in circulation (%) – Developers		**1,05%**	**1,20%**	**4,00%**	**6,00%**	**8,00%**
Tokens in circulation (%) - Users		**0,95%**	**1,00%**	**3,00%**	**5,00%**	**7,00%**
Total AppCoin tokens supply in circulation (Developers and Users)		**14 000 000**	**15 400 000**	**49 000 000**	**77 000 000**	**105 000 000**
Estimated Market Cap		**$2 000 000**	**$3 578 433**	**$24 879 522**	**$98 982 056**	**$18 798 097 690**
Price of each AppCoin Token	**$0,10**	**$0,14**	**$0,23**	**$0,51**	**$1,29**	**$179,03**
AppCoin Token Appreciation (since crowdsale)		*42,9%*	*132,4%*	*407,7%*	*1 185,5%*	*178 929,5%*

Given these assumptions, we envision that the AppCoins cryptocurrency price will grow as shown in Figure 17, having a market valuation almost 12 times bigger than the price of crowdsale after two years, and 1 789 times bigger after 5 years.

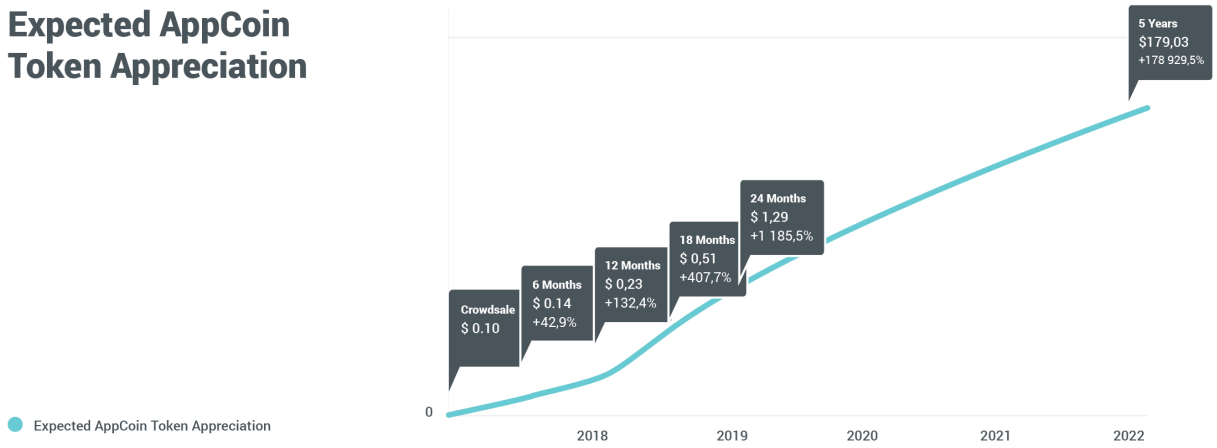


Figure 17 - Expected AppCoin Token Value Appreciation

As introduced in section 3 and further explained on the Annex to this document, the AppCoins economy is circular, and is likely to be a “von Neumann Economy”. Under the assumptions of that model, optimal growth should follow the “von Neumann Ray” or “turnpike” at the equilibrium. At this stage, the ratio between the income (the capital output, or more precisely the value of the AppCoins used in advertising and IAP) and wealth (the cumulative wealth in all the AppCoins wallets minus the income), should be constant over time [47]. We’ll assume that wealth can be approximated by the market cap minus the estimated added value of the economy in Table 6. To analyze if our business case is close to the ‘turnpike’ we compare the overall wealth with its corresponding income overtime. Figure 18 shows the result of the turnpike analysis for the AppCoins projected growth path:

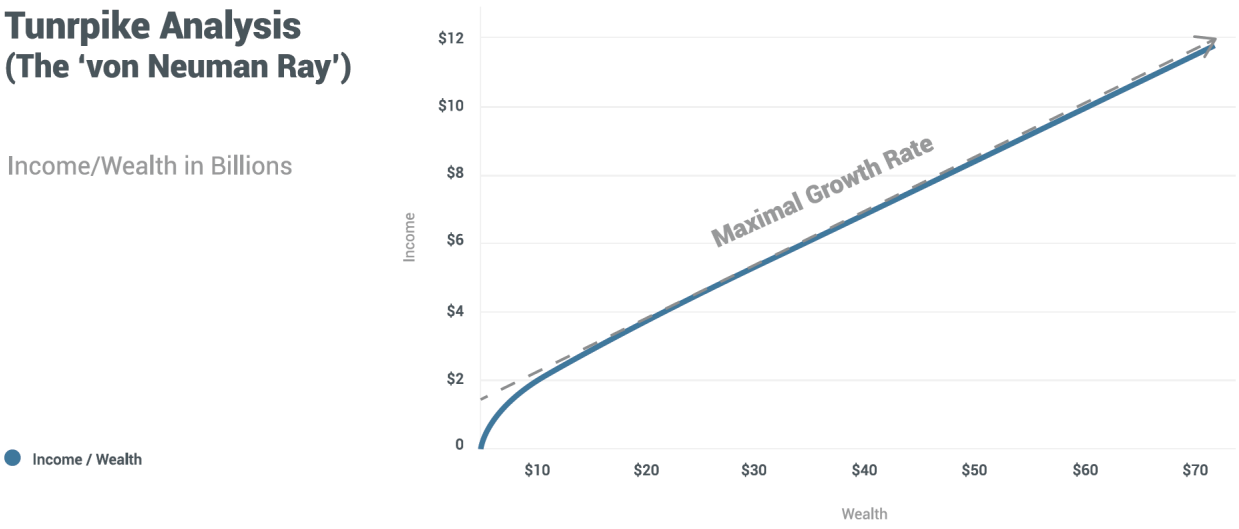


Figure 18 - Turnpike Analysis (The 'von Neumann Ray')

It is apparent that under the assumptions of our business case, the AppCoins platform should approach the optimal growth path after its value reaches the $20 billion mark. This matches the end of our 5-year forecast (December 2022), where each AppCoin will be worth more than $125 (see Figure 16).

We'll also confirm if the income-wealth conservation law [48] holds for our business case. For that, we'll compute the income-wealth ratio using the theoretical expressions introduced in the annex to this document. We shall assume that developers will have a profit margin of 50%. App stores and OEMs have the AppCoins' smart contract value of 15%. We assume, conservatively, that these profits will be leaving the AppCoins system (meaning that developers reinvest 50% of their IAP profit). We've computed the income-wealth ratio ($\frac{W_t}{Y_t}$) since month 12 until month 100. The results are presented in Figure 19.

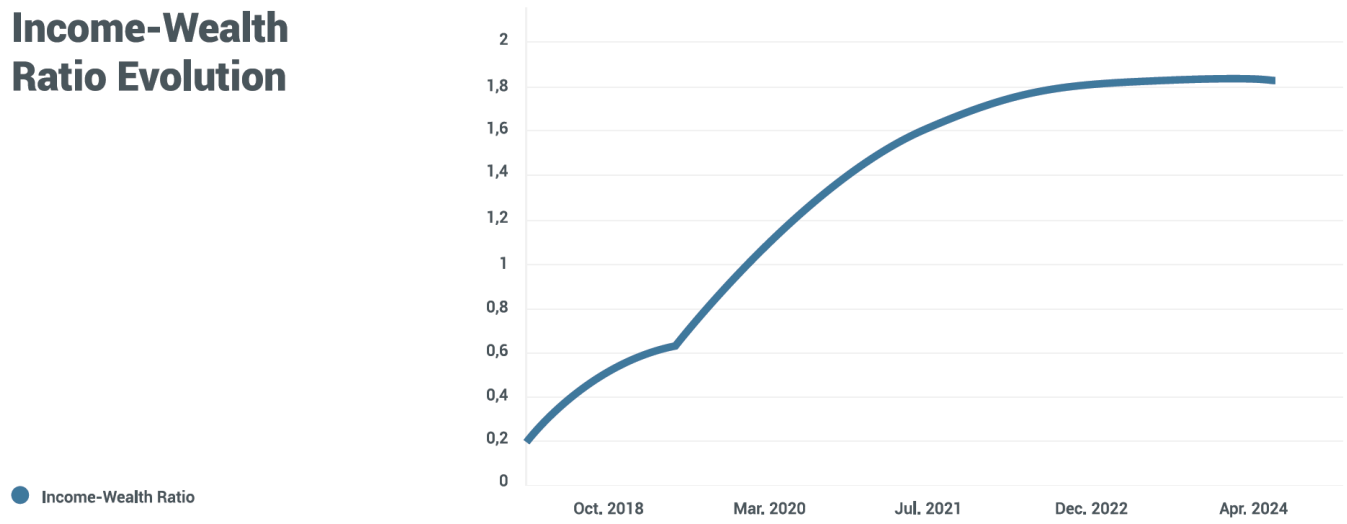


Figure 19 - Income-Wealth Ratio Evolution

We can see that, over time, this macroeconomic indicator will tend to stabilize around 1.80. Its value will start to stabilize around the end of the 5-year period (in December 2022) which is consistent with the turnpike analysis and our business case. This behavior is consistent with well-known empirical results that show that the fastest growing economies (mainly U.S.) always have income-wealth ratios that stay approximately constant over time [49], [50]. This analysis suggests that our business case matches the theoretical predictions of an optimized efficiency (further explored in the Annex of this document).

5 The App Store Foundation

5.1 Overview

At its core, the AppCoins ecosystem is envisioned to be formed by a community of app stores that adopt the AppCoins cryptocurrency to provide higher financial and operational benefits to the key stakeholders of their services: the app developers and the app users. By doing so, this community of app stores will drastically improve the efficiency of the whole app economy while also mitigating current technological challenges like the lack of transparency and digital fraud in advertisement, lack of users' trust in current digital payment mechanisms and the lack of accessibility of the app users to the economy (lack of money or of payment methods).

To ensure the independence and sustainability of AppCoins, a foundation will be created as a not-for-profit organization: The App Store Foundation (ASF). The mission of the ASF is to assure the open governance of the AppCoins ecosystem, to support its development (after the initial implementation performed by Aptoide) and the continuous open innovation of the technology. Furthermore, it is also AFS's mission to promote the global AppCoins adoption and support among the direct stakeholders, app stores, users and developers, and among key strategic entities for the scaling up of the ecosystem user base, such as OEMs, governments or telco companies.

Moreover, given that the AppCoins system is built upon several other projects and technologies, we believe that it is important to give something back to the related community. The blockchain and cryptocurrencies are still in their infancy and there are still several challenges to be solved in order to fulfill the industry's potential, like latency, scalability and transaction costs. Projects and innovations will emerge to bring the benefits of the technology to the daily lives of people. As a way of recompensing the blockchain community, the ASF aims at supporting open source projects in its areas, as we believe that these contribute to creating communities able of fostering innovation. In addition, ASF will sponsor events for people to present progress regarding the work in the field, fostering the share and discussion of innovative ideas.

5.2 Objectives

Aligned with the ASF mission, it is possible to enumerate and further specify its objectives as follows:

(1) **Governance**: Assure the independent, fair and transparent governance of the ecosystem, taking into account the opinions and needs of the majority of community members. The actions of governance encompass decisions related with participation rules, compliance guidelines, new technology / projects approval and any other decision that affects the community or the AppCoins ecosystem.

(2) **Development**: Assure and manage the funds for the development of the reference implementation of components in the AppCoins protocol, as well as for its maintenance and scalability (after the M18, when the Foundation is created and takes control over the AppCoins protocol and ecosystem). This shall be done by fostering the creation of a community of developers working on the open AppCoins ecosystem.

(3) **Innovation**: Assure a continuous open innovation of the platform, directing and funding research and development projects approved by the community, as well as the integration of viable results on the AppCoins ecosystem. Acquiring external funding (e.g. at Research and Innovation frameworks like NSF or H2020) shall be considered for these initiatives.

(4) **Dissemination**: Assure the promotion of AppCoins globally, fostering the adoption and support among direct stakeholders, like app stores, users and developers, and among key strategic entities for the sustainable scale-up of the ecosystem, like OEMs, governments or telco companies.

5.3 Operational aspects for the ASF formation

To direct the inception of the ASF, these are the following guidelines and roadmap:

- The Board of the Foundation will be elected by the AppCoins owners, with voting weight proportional to the number of AppCoins they own.
- The Board Members vote for the approval of new protocol versions proposed by the community of developers.
- Besides the initial resources of allocated AppCoins (15%), the foundation can conduct the necessary actions to have independent revenues, like event organization, membership fees or others, and for funding, like the application for Research and Innovation incentives (e.g. H2020).

Table 8 - Roadmap for the inception of the Foundation

May 2018	November 2018	May 2019
Discussion of the Foundation rules and bylaws (Founders and AppCoins holders)	Foundation creation and board election by AppCoins holders	Foundation takes over the protocol definition and reference implementation

6 Roadmap

6.1 Organizational

6-11-2017 (updated information at www.appcoins.io) – Pre-sales of ICO with white listing. To ensure a good dissemination of tokens, the pre-sale will disseminate 12% of the tokens by the apps economy players with maximum caps for each person, as presented in section 7.1.

TBD (updated information at www.appcoins.io) – ICO is launched

May 2018 - Public discussion of ASF rules and bylaws. The ASF has been described in the section 5 as the body that will coordinate the efforts of the protocol development. The discussion of the bylaws and internal organization is important to guarantee a balanced governance.

November 2018 – ASF creation under the bylaws defined by the community and AppCoin tokens holders.

May 2019 – ASF takes over the Protocol definition and reference implementation.

6.2 Technical

06-11-2017 – **AppCoins protocol V1** is made available. Although a protocol is a set of rules that can permanently be enhanced, is important to define some milestones and release major versions. The reason is to allow the development of a reference implementation of a specific version of the protocol, and prevent the "moving target" syndrome. This first version is the result of the feedback of many contributors in the community and comprise the technical definition of the three main flows: in-store app advertising, in-app purchase with tokens and reputation building.

May 2018 - Proof-of-concept of the protocol implementation and client integration. This milestone comprises two different deliverables. On one hand, an open source reference implementation of libraries, command line tools and SDK for AppCoins developers to have a healthy and easy-to-use development environment. These libraries will allow that a new app store or a developer can join the AppCoins protocol in a faster way, without having to develop everything from scratch.

On the other hand, a first implementation of the AppCoins protocol by a "client", in this case Aptoide app store. For this MVP, an APK of Aptoide app store "Dev version" (https://aptoide-dev.en.aptoide.com) will be made available. This version of Aptoide (v9.0_dev) will support the main financial flows: install advertised apps earning tokens and doing in-app purchases with tokens. This version of Aptoide will not integrate the reputation system as the development require that transactions exist to build the reputation, which only happens after the first deployments.

The aforementioned version will not include side-chain integration with a state channel / payments channel. We consider that that a potential integration so soon in the development roadmap would force to make wrong decisions, result of the used technology (Raiden, OmiseGo) not be ready according to those projects' technical roadmaps. The transactions in this Aptoide version will be directly in the blockchain, which is reasonable in terms of transaction fees and scalability since the user base will be restricted to testers of the developers' version.

November 2018 – Production roll-out to all Aptoide clients (and other participant app stores).

In one year time, and as a result of the feedback of the "dev" version and further developments done by the team, a "stable" version will be released. This version will implement version "1.1" (or later) of the protocol. This version will include a side-chain platform to perform the core transactions as state channels / payment channels. Depending on the number of developers that already integrated AppCoins, the token use can be one option (together with other payment systems) or could be the only option. This version will benefit of the large Aptoide user base (200 million unique users), providing a diverse sample of the available versions of Android versions and Android devices.

May 2019 – AppCoins Protocol Vx. The protocol is a “live” document that under the ASF foundation will receive contributions from the community and the research projects developed inside the community. New flows and use cases that benefit the app store ecosystem can be covered in future versions of the protocol.

For instance, the ASF foundation can extend the reach of the protocol to areas like: 1) Advertising exchanging and Auction, allowing a richer exchange of Ads between app stores (e.g. an app store serving an Ad from other app store inventory) 2) digital in-game products platform, allowing a marketplace where digital products bought with AppCoins inside games and apps, can then later be exchanged (given or sold) across end users.

6.3 Business

May 2018 - 500 key developers’ engagement to integrate AppCoins SDK in their apps & games. The first effort will be to bring developers on-board. Using the 12.000 top developers Aptoide network will leverage this effort.

November 2018 – Tier 1 OEMs (Xiami, Oppo, Vivo, ...) engaged and pre-loading. Aptoide Shenzhen (South of China) office will be responsible for the kick off of this task. Opened in September 2015, this office has 3 people full-time and have a strong network in the Shenzhen ecosystem.

May 2019 – AppCoins Protocol Viral actions with users – peer-to-peer actions. As explained on the section 7.2 this will replicate some of the already tested digital marketing viral initiatives. Coming after the engaging of Developers and OEMs, at this phase the users will find a thriving app store ecosystem.

7 Token Allocation, Crowdsale and Bootstrap

7.1 Token Allocation

In order to fund and boost the AppCoins roadmap, an Initial Coin Offering (ICO) will be conducted. The details for the ICO are presented in Table 9, and it will follow the roadmap presented in the previous section.

Table 9 - ICO Details

Total number of tokens	700 million
Tokens available	280 million (40%)
Initial value per token	US$0.10
Emission rate	No further tokens will be created
Token pre-sales	12% of all tokens Uncapped, fixed price First come, first served Discount: 30% Only for ecosystem players
Token sales	28% of all tokens Uncapped, fixed price Open to the public
Soft Cap	US$2.5M
Hard Cap	US$28M

The pre-sales will be performed accordingly to the following rules:

Table 10 - Token pre-sale rules

		Criteria	Max tokens per entity	Min tokens per entity	Minimum Investment	Maximum Investment
Class A	Aptoide Users	Using Aptoide	25 000	100	US$10	US$2 500
Class B	OEM Partners	Be a partner in Aptoide Partners program	50 000	1000	US$100	US$5 000
Class C	Developers in Aptoide or Play Store	Be a certified developer in Aptoide's CPP program	50 000	1000	US$100	US$5 000
Class D	Institutional Investors	By invitation	TBD	TBD	TBD	TBD

The pre-sale and public sale will distribute 40% of the total number of AppCoin tokens. The remaining tokens will be distributed as follows:

- **App Store Foundation - 15%** - for the creation of the foundation and support of its vision and goals;
- **Bootstrap initiatives (Developers, OEMs, users) - 20%** - to support and speed up the adoption of AppCoins;
- **Key Contributors - 10%** - for the influential blockchain key elements and contributors to the ICO idea development;
- **Aptoide - 15%** - for the initial support and contribution to the community.

Figure 20 depicts the AppCoins' tokens allocation as previously described.

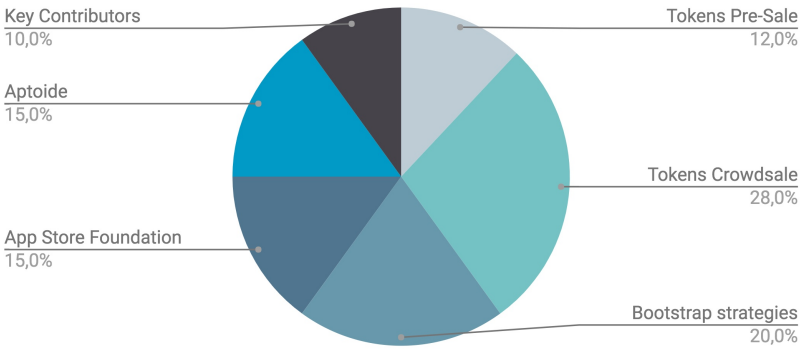


Figure 20 - Token Allocation (%)

All the AppCoin tokens, except those used to speed up the adoption, will be attributed when the crowdsale process ends, on a token distribution event (more details at www.appcoins.io). The tokens that will be used to speed up the adoption of AppCoins, 20% of the total amount, will be distributed to developers, OEMs and users as shown in Figure 21.

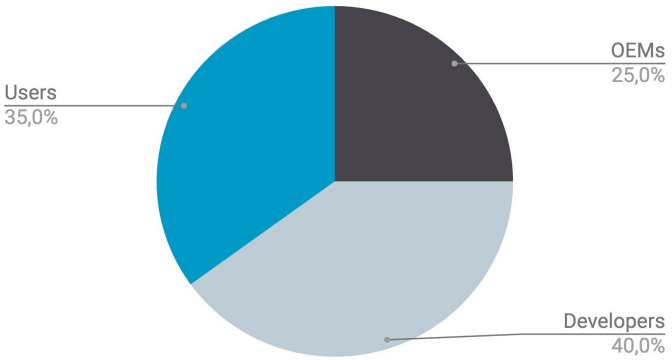


Figure 21 - Bootstrap Token Distribution

This particular distribution of the tokens is due to the fact that developers, users, and OEMs are key players in the app economy and their engagement is a key factor for the success of AppCoins. Specifically:

- **Developers:** Have to adopt AppCoins as (1) the model of app advertising and (2) as the method of payment for IAP. Therefore, developers are critical players for the adoption of AppCoins. AppCoin tokens will be distributed to key developers (who have apps with a large user base) in order to foster their swift understanding of the benefits that the system brings to them and to speed up their adoption. These players will be incentivized from the beginning of the project given that they have to provide means for the users to be able to use AppCoins in their apps.
- **OEMs**: The device manufacturers have the power to considerably influence the app economy, given that they select which app stores to include by default on the mobile devices. Therefore, a share of AppCoin tokens will be delivered to these players to incentivize them to integrate app stores that adopt the AppCoins model. The rollout with OEMs is scheduled for the 6th month onwards, when an MVP is available and a critical mass of developers is onboard.
- **Users**: Along with developers, users are the key target audience of AppCoins, for whom the envisioned ecosystem brings improved trust and accessibility to the app economy (the availability of AppCoins to spend in the economy adds the value and the payment method). The allocation of tokens to users will be used to speed up their adoption.

The strategies of bootstrapping for each of these players are presented in 7.2.

7.1.1 ICO funds distribution

The funds received from the AppCoins crowdsale will be applied in: (a) development of the solution; (b) marketing towards its dissemination and adoption; (c) strategy and operation; and (d) legal costs. Figure 22 depicts the funds distribution.

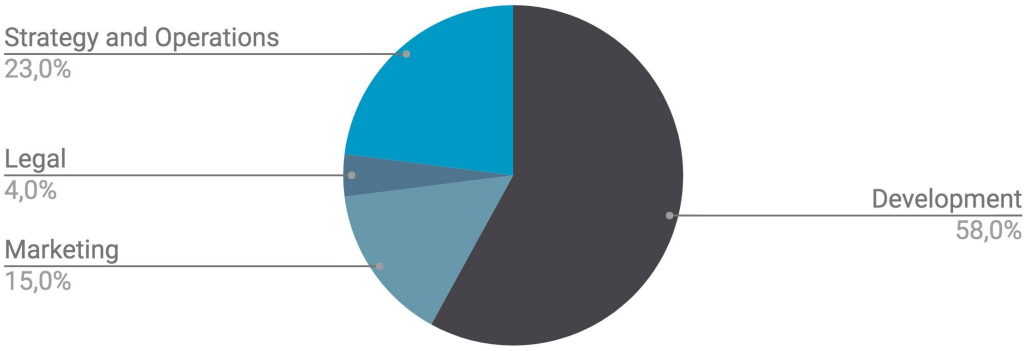


Figure 22 - ICO funds distribution

Development (58%)

The technical development is paramount for AppCoins' success, which is why the majority of the fund allocation will go into this effort. Aptoide's engineering team, with its wide experience in architecture and development of app stores' solutions (including payments and advertising), will form the basis for this team, which will be enriched with the hiring of blockchain specialists.

Marketing (15%)

The marketing costs include those for the initial promotion of AppCoins to developers, users, OEMs and app stores. These include a marketing team that will drive a worldwide dissemination effort, namely of the multilingual website, community building, social network presence and relation efforts.

Strategy and Operations (23%)

This includes costs for different teams, namely business development, administration and finance, strategy, and the whole cost for the operation of the project (participation in events, travel and equipment). The business development team will be responsible for approaching and maintaining contact with the target audiences of AppCoins. The administrative and finance teams will be responsible for controlling and dispensing the funds accordingly to the project needs and to provide regular reports to the management / strategy team. The strategy team will be formed of key contributors to the AppCoins idea and technological and business managers, which will orchestrate the project teams towards AppCoins vision and goals until the transfer of the governance to the AFS is completed.

Legal (4%)

The legal team will provide advice in the aspects related to the technical regulations, IPR, foundation creation and policies specific to each local market.

The resources released by the ICO will be applied by Aptoide in the development, marketing, strategy and operations, and legal efforts, to bootstrap the AppCoins platform. Further description of Aptoide can be found in section 8.

7.2 AppCoins Bootstrap strategy

The bootstrap strategy consists of engaging with the ecosystem players to speed up their adoption. Following are presented examples of actions that comprise this strategy:

7.2.1 Developers

AppCoin tokens will be attributed to developers in the bootstrap phase to encourage them to add their apps to app stores powering AppCoins. To foster the developers' fast and wide adoption, AppCoin tokens will be attributed as follows:

- For the **first upload of each app** to an app store powering AppCoins, the first 50 conversions will not be charged and the AppCoins related to the CPAt will enter the economy as if the developer paid for the service.

7.2.2 OEMs

During the bootstrap phase, to get OEMs onboard and have them including app stores powering AppCoins, there will be a bonus attribution of tokens as follows:

- **5 AppCoins per device** with an app store powering AppCoins.
- **For each 500 devices deployed** with an AppCoins app store by default, **a bonus of 500 AppCoins is attributed**.

7.2.3 Users

Users earn AppCoins from ad triggered installs and from spending 2 minutes of their attention (watching for 2 minutes) to the installed apps. During the bootstrap phase, to speed up the adoption of the system, tokens will also be distributed to the users as follows:

- Users receive **3 AppCoins on the first install of an app store** that powers AppCoins.
- With **each purchase** of AppCoin tokens, **users receive twice as much as the purchased AppCoins**.

- Users receive **3 AppCoins after each referral to friends** to install an app store powering AppCoins. The tokens are delivered after the registration of the user invited who also receives 3 AppCoins).

8 About Aptoide

Founded in 2011, Aptoide is the first decentralized and social Android App Store. With nearly 200 million users, 4 billion downloads and 1 million apps, Aptoide is a community-based platform that reinvents the App discovery experience through a social environment, tailored recommendations and the opportunity for users and partners to create and share their own personalized App Stores. Aptoide also provides white-label App Store solutions for developers, OEMs, Telcos and Integrators, through which they can upload and distribute their Android Apps. Different versions of Aptoide are available for mobile, TV and VR devices and is accessible in over 40 languages. Aptoide is the 692nd most visited Website worldwide, according to Similarweb. Amongst its main partners are OEM's like Xiaomi and app publishers such as ZeptoLab and Goodgame Studios. It currently has more than 85 employees from 15 different nationalities, has its HQ in Lisbon and local offices in Shenzhen (China) and Singapore.

Over the years the project has had funding from several sources: In 2013 it received seed funding from Portugal Ventures (750 000 euros) and, in 2015, has secured a Series A financing round of 3.7 million euros lead by e.ventures with co-investment from Gobi Partners (China) and Golden Gate Ventures (Singapore).

Aptoide has the perfect conditions for leading the development and dissemination of AppCoins in the first 18 months:

- **Open source culture**: Aptoide code is open source (GPL V2), the technology stack of its infrastructure is 99% open source and it is a spin-off of a research center/company that developed a Linux Distribution with more than 900.000 users (Linux Caixa Mágica);
- **Significant user base:** 142 million people used Aptoide App Store to install at least one App in 2016;
- **Industry network and reach:** with direct relationship with more than 10.000 developers, and 60 OEMs and Telecom's, Aptoide will use this network to disseminate AppCoins awareness and engagement;

- **Resources:** the current team of more than 85 people is spread among 3 offices (Lisbon, Singapore and Shenzhen) will be reinforced with specific resources to implement the protocol and libraries.

Annex

This annex complements the economic analysis made on the crowdsale document, further exploring the AppCoins model and impact in the apps economy. Specifically, this document focuses on the AppCoins alignment with a von Neumann Economy and on the AppCoins' network effects.

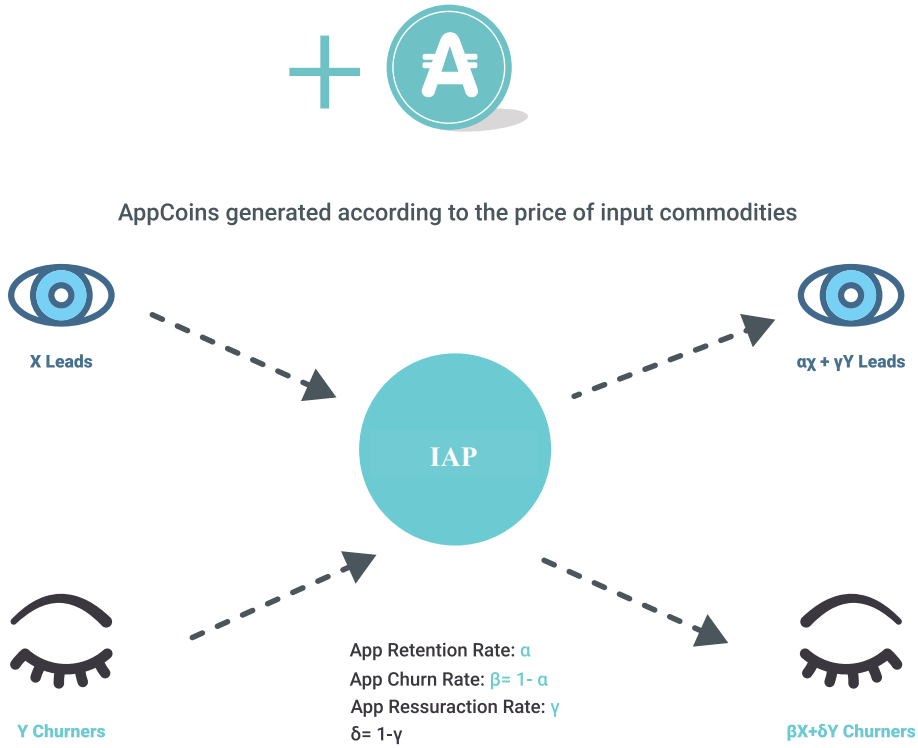
a. The von Neumann App Economy

The circular economy concept described in the crowdsale document is consistent with the optimal growth model as envisioned by Jon von Neumann [51]. Markets that behave similarly to the model are healthy economies. AppCoins may be conceptualized as a real-life example of such an economy. Let's see why.

Imagine we have three commodities: Prospects, Leads, and Churners. When a new user joins AppCoins they increase the supply of Prospects for every app. Apps are looking to reach out to Prospects to convert them to Leads. This is done through advertising. They are willing to invest capital to pay for the attention of these Prospects, transforming them into Leads. The AppCoins conversion process ensures that exactly one Prospect will be transformed into one Lead. This assurance is possible through the Proof-of-Attention system.

Process 1 – Advertising

After obtaining Leads, they have the opportunity to monetize them. Some apps are better at this than others. An IAP monetization process results in different amounts of active leads and churners for different apps. This happens because different apps have different retention and resurrection rates.



Process 2 – In-App Purchase

Let's assume that the IAP process generates AppCoins for the developer according to the value of the input commodities. Over time Churners will be very common. This happens because most apps have high churn rates (α) [52] and low resurrection rates (γ). Churners have a low value. Leads will have a high value. These commodities cannot be exchanged between apps.

Apps will have to decrease their churn rates over time or perish. Developers will need to have a portfolio of apps in order to reduce risk. Some apps will have more market maturity than others. Growing apps require an advertising investment for growth, and mature ones are ripe for harvest through IAP monetization. This is consistent with traditional product portfolio models such as the BCG Matrix and the McKinsey/GE Model. Unless your app is highly mature (high α, possibly high γ), you'll produce little capital in the IAP monetization process. It also means that you have to invest in R&D efforts to develop new apps, which may not be successful apps. Continuous innovation is your only choice.

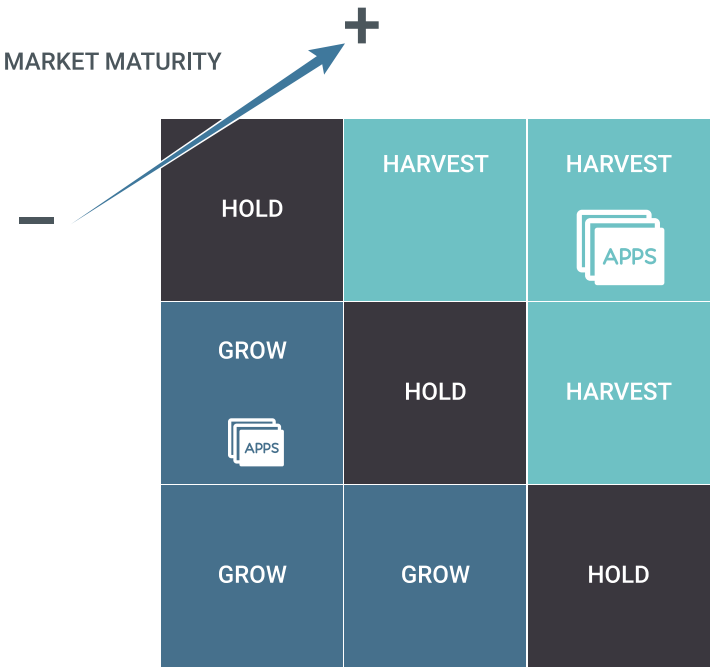


Figure 23 - McKinsey/GE Product Portfolio Model

One of the reasons so many apps are not able to retain users is the current app economy life cycle. The number of mature apps versus the total number of apps will be very small. This is because of the current early stage of the app economy life cycle in most emerging markets [53]. Public data suggest that IAP revenue will grow strongly once emerging markets reach maturity. This is consistent with the conclusion that globally, the app economy is still on a growth stage [20].

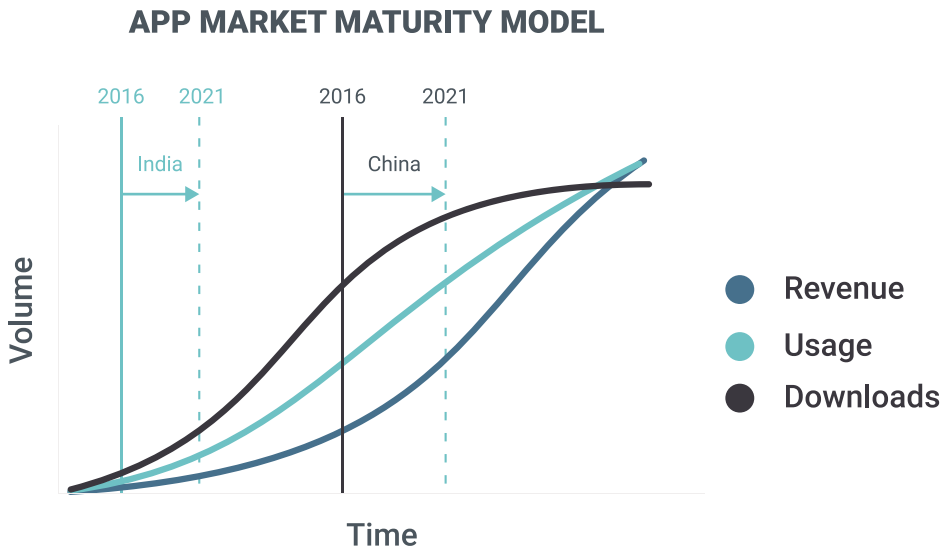


Figure 24 - App Market Maturity Model (Source: AppAnnie)

This explains why industry reports consistently show that the churn rate for most apps is extremely high [52]. The current percentage of apps capable of efficiently capturing user attention is

very small. Especially when compared to the overall number of apps available in the app stores [18]. This is consistent with the von Neumann assumptions.

Here's why:

- The average app retention (α) and resurrection rates (γ) will be very small (based on the current app economy lifecycle stage).
- Developers have to invest in advertising before being able to monetize with IAP. Eventually, developers will need to reinvest a part of their earnings to support the new and growing apps.
- Assuming that around half of the developer profit is reinvested in advertising, a large portion of the capital is retained in the system because the AppCoins given to the users for their attention need to be invested in IAP.
- AppCoins ensures that user acquisition depends on the user experience, removing friction from the ad tech value chain.

Based on this we can argue that **von Neumann's model requirements are met**. We can therefore assume that AppCoins should have a balanced growth following a path close to the **"von Neumann Ray"**[2].

The model predicts that at the "maximal growth" stage, the ratio between income and wealth is constant. Income is the value of tokens being used in transactions (Y_t). Wealth is the total value of the AppCoins economy (W_t) minus the income. Under the von Neumann assumptions, this indicator should become stable over time. This is the **income-wealth conservation law** of the **von Neumann Model**:

$$\frac{W_t}{Y_t} = constant$$

To measure how close we are to the optimal path, AppCoins may look to the variance of the income-wealth ratio ($\frac{W_t}{Y_t}$) [49]. The lower the variance of this ratio on a given time interval, the closer

---

[2] We are assuming that the Advertising and IAP processes in the AppCoins economy should not be bound by 'sectorial' production limits (which would impose a non-balanced, cyclical growth [51]). With the Proof-of-Attention system, the developer should be able to control its own 'Leads' production level (the basic commodity of the system) and should be aware of their own user retention (and resurrection) rates. Taken this into account, plus the fact that AppCoins is a decentralized economy, we can assume that the economy should have a balanced growth - also known as growing according to a "von Neumann Ray" or turnpike [47].

we are to the optimal growth path on that interval. In the section 0 of the crowdsale document, we see that under the current economic conditions, this income-wealth conservation will occur. This ensures the optimal valuation growth of the AppCoins token and value for the investors.

While many of these mechanisms already exist in the current app economy, AppCoins technology reinforces it. It reduces the app economy's attritions substantially and reinforces natural market forces. This means increased economic efficiency for all the stakeholders.

b. Network Effects

AppCoins is a platform based on the blockchain. It has the potential to become a standard industry protocol – the universal language of the app economy. With this in mind, we expect its value to grow steadily with its adoption, which is an incentive for stakeholders.

The value of successful blockchain technologies is known to follow the Metcalfe's Law of network value [46]. According to this law, the value of the network increases proportionally to the square of the number of its users (the direct network effect).

We can estimate the value of AppCoins based on its user base on a given moment based on its direct value:

$$V_t(n_t) = k{n_t}^2$$

V_t→Value of the AppCoin platform on moment t

k →Constant of proportionality

n_t→Number of Users on moment t

The growth of online networks comes from new user adoption and retention. Blockchain growth follows the pattern of known innovation adoption models such as the Bass diffusion model [54][40]. The Bass diffusion model has been the gold standard of new product adoption forecasting of the last five decades [55]. We'll use this to forecast the growth of AppCoins. We only require mild assumptions such as potential market size and well known average parameter values [41][56]:

$$S_t = pm_t + (q-p)Y_t - \frac{q}{m_t}(Y_t)^2$$

$$Y_t = \sum_{i=1}^{t-1} S_i$$

S_t→Adoption at moment t

p →Coefficient of innovation (Advertising Effect)

Y_t→Cumulative adoption until t-1

q →Coefficient of imitation (Word-of-Mouth Effect)

m_t→Total market potential at moment t

We expect an initial “quiet growth” stage, followed by a sudden growth, once AppCoins reach critical mass [46]. This is consistent with observed empirical data on online networks adoption [57].

While this explains direct network effects we also need to take into account indirect effects [58]. Direct effects refer to the utility of the network to each user, which increases with the number of users (this is the effect measured by Metcalfe’s Law). Indirect effects are further divided into two subtypes [59]: demand side and supply side. Demand side refers to the consumer benefits due to having more adopters. For instance, due to being able to send and receive money from users that adopt AppCoins. Supply side refers to the business benefits of having a larger market. They can provide additional complementary services to the network users. Because of this, we argue that AppCoins should exhibit both **direct effects** and **indirect effects**.

Additional typologies of network effects have been presented by industry experts [60] [61]. These new typologies include up to eleven different types of network effect. We’ll analyze the ones we believe should be relevant in the AppCoins ecosystem:

1. **Personal Utility:** Suppliers can provide extra new services to AppCoins users, as AppCoins are developed using the ERC20 infrastructure. While harder to quantify, plug and play effects will also have a significant impact on the network value.
1. **2-Sided Platform:** AppCoins is a protocol leveraging the Ethereum Blockchain that allows several actors to speak a common language. One side provides something by integrating their value “pipes”. The other side receives that, while also selling their output to other platform members. This is consistent with well-known platform effects [62].
2. **2-Sided Marketplace:** AppCoins is also an advertising marketplace. Advertisers (developers) are purchasing ad-space offered by publishers (app stores and other developers). Once publishers provide an interesting market for advertising, the advertisers’ demand increases, ad space increases with it, and so forth.
3. **Bandwagon:** Once AppCoins, designed to be a universal standard, reaches its critical mass, it then becomes an industry standard. This effect is consistent with observed bandwagon effects in social networks. Adoption from one user is contingent on the adoption of the other more influential (central) users in his social network [63]. Once a threshold has been reached, even more users adopt [64]. The effect should continue to be observed over the growth of AppCoins.

In the section 0 of the crowdsale document, we present our business case with the actual expected values of a user adoption scenario. This scenario was built using the Bass diffusion model. We assume the value of the platform will grow proportionately to the adoption, according to

Metcalfe's law. This however only quantifies the direct effect. As we've seen, indirect effects will also have a substantial positive impact on the valuation.

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